THE NATION'S REPORT CARD

1996 Assessment

MATHEMATICS–PUBLIC RELEASE

Grade 4

Number of Items: 33

SECTION 3

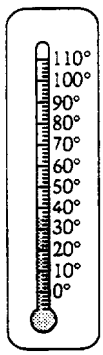
Section 3

This part has 10 questions. Mark your answers in your book. You will have to fill in an oval or write your answer as directed. The last question may require 5 minutes or more to think about and answer.

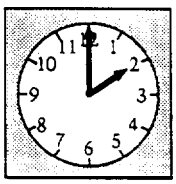
1. How many fourths make a whole?

   Answer: _____ Q000698

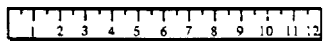
A



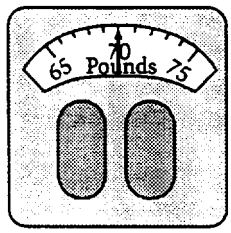
B



C



D



2. Which of these instruments best measures each of the following?

   (a) Length Ⓐ Ⓑ Ⓒ Ⓓ

   (b) Temperature Ⓐ Ⓑ Ⓒ Ⓓ

   (c) Weight Ⓐ Ⓑ Ⓒ Ⓓ M000648

GO ON TO THE NEXT PAGE

3. *N* stands for the number of stamps John had. He gave 12 stamps to his sister. Which expression tells how many stamps John has now?

Ⓐ N+12

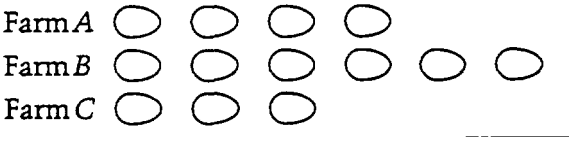
Ⓑ N–12

Ⓒ 12- N

Ⓓ 12 x N

Q000706

CARTONS OF EGGS SOLD LAST MONTH



Each ◯ = 100 cartons

4. According to the graph, how many cartons of eggs were sold altogether by farms *A*, *B*, and C last month?

Ⓐ 13

Ⓑ 130

Ⓒ 1,300

Ⓓ 13,000

Q000701

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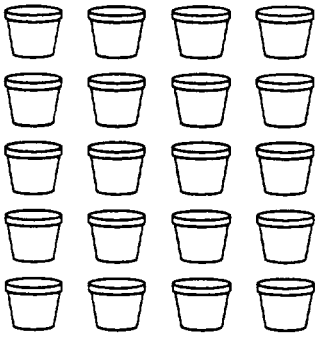


5. The picture shows the flowerpots in which Kevin will plant flower seeds. He needs 3 seeds for each pot. Which of the following number sentences shows how many seeds Kevin will need for all of the pots?

Ⓐ 5 x 4 x 3 = ☐

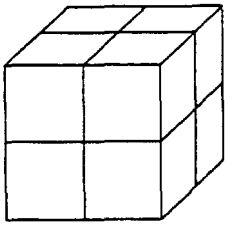
Ⓑ (5 x 4) + 3 = ☐

Ⓒ (5 + 4) x 3 = ☐

Ⓓ 5 + 4 + 3 = ☐

M000502

Section 3



6. In this figure, how many small cubes were put together to form the large cube?

(A) 7

(B) 8

(C) 12

(D) 24

Y002380

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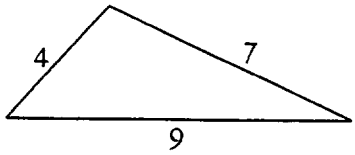
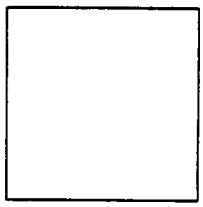
7. Ms. Hernandez formed teams of 8 students each from the 34 students in her class. She formed as many teams as possible, and the students left over were substitutes. How many students were substitutes?

Answer: _____

Q000702

GO ON TO THE NEXT PAGE





8. If both the square and the triangle above have the same perimeter, what is the length of each side of the square?

Ⓐ 4

Ⓑ 5

Ⓒ 6

Ⓓ 7

QOO0705

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9. There are 3 fifth graders and 2 sixth graders on the swim team. Everyone's name is put in a hat and the captain is chosen by picking one name. What are the chances that the captain will be a fifth grader?

Ⓐ l out of 5

Ⓑ l out of 3

Ⓒ 3 out of 5

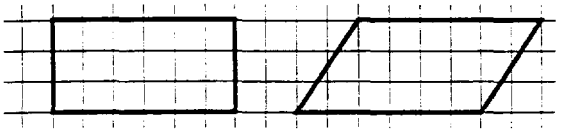
Ⓓ 2 out of 3

QOO0709

GO ON TO THE NEXT PAGE

Section 3

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above alike? List as many ways as you can.

In what ways are the figures above different? List as many ways as you can.

QO01390

GO ON TO THE NEXT PAGE

If you need more room for your work, use the space below.

NAEP MATHEMATICS CLASSIFICATION CODES

Following this description of the Classification Codes, there is a single sheet with NAEP ID numbers, short descriptions of the items, item keys (1 -5 if the item is multiple-choice; blank if the item is open-ended), as well as the p-values for the items in the released block.

After the single sheet with NAEP IDs, there follows a 4-line listing of information about each of the items in the released blocks. If the item is open ended, the Key is given as either "NONE" or "See scoring guide." There are seven fields under the line "Classification Codes" in the listing of items. The fields areas follows:

Field 1: **AGE/GRADE CLASSIFICATION**

01 Grade 4
02 Grade 8
03 Grade 12

Field 2: **CONTENT AREA: A, B, C, D, E**

A Number Sense, Properties, and Operations
B Measurement
C Geometry
D Data Analysis, Statistics, and Probability
E Algebra and Functions

Field 3: **SUB-CONTENT AREA**

This category varies depending on the value in field 2.
Possible choices are given below.

*If field 2 is **A:*** Number Sense, Properties, and Operations

1. Relate counting grouping, and place value
2. Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols.
3. Compute with numbers (i.e., add, subtract, multiply, divide)
4. Use computation and estimation in applications
5. Apply ratios and proportional thinking in a variety of situations
6. Use elementary number theory

*If field 2 is **B:** Measurement*

1. Estimate the size of an object or compare objects with respect to a given attribute (e.g., length, area capacity, volume, and weight/mass)
2. Select and use appropriate measurement instruments (e.g., manipulative such as ruler, meter stick, protractor, thermometer, scales for weight or mass, and gauges)
3. Select and use appropriate units of measurement, according to two criteria (type of unit; size of unit)

4. Estimate, calculate (using basic principles or formulas), or compare perimeter, area, volume, and surface area in meaningful contexts to solve mathematical and real-world problems
5. Apply given measurement formulas for perimeter, area, column, and surface area in problem settings
6. Convert from one measurement to another within the same system (customary or metric)
7. Determine precision, accuracy, and error
8. Make and read scale drawings
9. Select appropriate methods of measurement (e.g. director indirect)
10. Apply the concept of rate to measurement situations

*If field 2 is **C:** Geometry*

1. Describe, visualize, draw, and construct geometric figures
2. Investigate and predict results of combining, subdividing, and changing. shapes (e.g., paper folding, dissecting, tiling, and rearranging pieces of solids)
3. Identify the relationship (congruence, similarity) between a figure and its image under a transformation
4. Describe the intersection of two or more geometric figures
5. Classifiy figures in terms of congruence and similarity, and informally apply these relationships using proportional reasoning where appropriate
6. Apply geometric properties and relationships in solving problems
7. Establish and explain relationships involving geometric concepts
8. Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems
9. Represent geometric figures and properties algebraically using coordinates and vectors

*If field 2 is **D:** Data Analysis, Statistics, and Probability*

1. Read, interpret, and make predictions using tables and graphs
2. Organization and display data and make inferences
3. Understand and apply sampling, randomness, and bias in data collection
4. Describe measures of central tendency and dispersion in real-world situations
5. Use measures of central tendency, correlation, dispersion, and shapes of distributions to describe statistical relationships
6. Understand and reason about the use and misuse of statistics in our society
7. Fit a line or curve to a set of data and use this line or curve to make predictions about the data using frequency distributions where appropriate
8. Design a statistical experiment to study a problem and communicate the outcomes
9. Use basic concepts, trees, and formulas for combinations, permutations, and other counting techniques to determine the number of ways an event can occur
10. Determine the probability of a simple event
11. Apply the basic concept of probability to real-world situations

*If field 2 is **E:** Algebra and Functions*

1. Describe, extend, interpolate, transform, and create a wide variety of patterns and fictional relationships
2. Use multiple representations for situations to translate among diagrams. models, and symbolic expressions
3. Use number lines and rectangular coordinate systems as representational tools
4. Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems
5. Interpret contextual situations and perform algebraic operations on real numbers and algebraic expressions to solve mathematical and real-world problems
6. Solve systems of equations and inequalities using appropriate methods
7. Use mathematical reasoning
8. Represent problem situations with discrete structures
9. Solve polynomial equations with real and complex roots using a variety of algebraic and graphical methods and using appropriate tools
10. Approximate solutions of equations (bisection, sign changes, and successive approximations)
11. Use appropriate notation and terminology to describe functions and their properties (including domain, range, function composition, and inverses)
12. Compare and apply the numerical, symbolic, and graphical properties of a variety of functions and families of functions, examining general parameters and their effect on curve shape
13. Apply function concepts to model and deal with real-world situations
14. Use trigonometry

Field 4: **SUBTOPIC:** a lower case letter further describing the topic
For specifics, see the National Assessment Governing Board's *Mathematics Framework for the 1996 National Assessment of Educational Progress,* pp. 21-36.

Field 5: **MATHEMATICAL ABILITY/PROCESS:**
CU Conceptual Understanding
PK Procedural Knowledge
PS Problem Solving
EO Problem Solving with extended open-ended questions

Field 6: **MATHEMATICAL THEME:**
RE Reasoning
CM Communication
CN Connections

Field 7: **CALCULATOR ACTIVITY**

01 **inactive -** questions whose solution neither requires nor suggests the use of a calculator in fact, a calculator would be virtually useless as an aid to solving a problem.

02 **neutral -** questions in which the solution to the question does not require the use of a calculator. Given the option, some students might choose to use it for numerical computations.

03 **active -** questions that, by their nature, require calculator use; a student might find it impossible to solve the question without the aid of a calculator.

In any field: NA = Not Applicable, or Not Available

AS AN EXAMPLE, the classification below

02 E l b CU RE 02

would be interpreted as follows:

Grade 8; Algebra and Functions; 1. Describe, extend, interpolate (etc.); b. Extend; Conceptual Understanding; Reasoning; Calculator neutral

Information about the Item Difficulty Available for Each Item

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Item identification a short item description and the key (for multiple-choice items) are provided, in addition to information about the item difficulty, for each item. The items are identified by their position within a block and by their NAEP IDs. The NAEP IDs are used to identify items during the analysis of NAEP data, in the summary of item level results in data almanacs, and in the secondary user data sources.

The numbers in the column labeled “P-Value” on the item statistic sheet vary for item types (multiple-choice and 2-category constructed-response items and constructed-response items with more than two categories). For the multiple-choice items and for the 2-category constructed-response items that were scored correct or incorrect, the number in that column is the percent of students correctly responding to the item. This value is often called the p-value or the P+ for an item. For constructed-response items with more than two categories, the value in the column is the mean item score for the item.

For example, if the number of categories for a constructed-response item is 3 with a category unsatisfactory/incorrect (category 1) worth 0 points, a partial category (category 2) worth 1/2 of a point and a complete category (category 3) worth 1 point, then a student can receive either 0, 1/2 or 1 point for his response to the item. The mean item score is the number that you would get if the scores on this item are averaged for all of the students in the assessment. This value varies from 0 to 1 just as the percent correct for a multiple-choice item could vary. It can be interpreted as an indication of where on the 0-1 scale for the item that an “average” student might score. For instance, if the mean item score for a 3-category constructed-response item is .8, then an “average” student would be expected to have a response in either category 2 (worth 1/2 or .5 of a point) or category 3 (worth 1 point). In fact, it is a little more likely that the student would have a response in category 3, since .8 is closer to 1.0 than to .5.

1996 Mathematics Items

GRADE: 04 BLOCK: 27M9

ITEM	NAEP ID	SHORT DESCRIPTION	KEY	CONTENT	PROCESS	P-VALUE	RELEASE STATUS
1A	M040301	RELATE A FRACTION TO 1 (R1)	2	1	1	0.498	P
2A	M040401	IDENTIFY INSTRUMENTS OF MEASUREMENT (PART 1)	3	2	1	0.771	P
2B	M040402	IDENTIFY INSTRUMENTS OF MEASUREMENT (PART 2)	1	2		0.792	P
2C	M040403	IDENTIFY INSTRUMENTS OF MEASUREMENT (PART 3)	4	2		0.766	P
2D	M040461	IDENTIFY INSTRUMENTS OF MEASUREMENT: NUM CORRECT		2	1	0.776	P
3	M040501	WRITE EXPRESSION USING N	2	5	1	0.669	P
4	M040601	USE DATA FROM A PICTOGRAPH	3	4	1	0.608	P
5	M040701	CHOOSE NUMBER SENTENCE	1	1	1	0.502	P
6	M040801	COUNT CUBES IN SOLID	2	2	1	0.334	P
7A	M040901	SOLVE WORD PROBLEM INVOLVING DIVISION & REMAINDER	2	1	3	0.394	P
8	M041001	RELATE PERIMETER TO SIDE LENGTH	2	2	3	0.263	P
9	M041101	DETERMINE A PROBABILITY	3	4	1	0.312	P
10A	M041201	COMPARE TWO GEOMETRIC SHAPES (RATER 1)		3	3	0.306	P

Content
1 = Numbers & operations
2 = Measurement
3 = Geometry
4 = Date analysis, statistics& probability
5 = Algebra & functions

Process:
1 = Conceptual understanding
2 = Procedural knowledge
3 = Problem solving

Mathematics 1996 Grade 4 Block 27M9

04/05/97

Item Number: 1 **Accession Number:** LQ000698
Key: NONE
Classification Codes:
01 A 3 NA CU NA 01

Item Number: 2 **Accession Number:** 0M000648
Keys: C, A, D
Classification Codes:
01 B 2 e CU NA 01

Item Number: 3 **Accession Number:** LQ000706
Key: B
Classification Codes:
01 E 2 NA CU NA 01

Item Number: 4 **Accession Number:** LQ000701
Key: C
Classification Codes:
01 D 2 c CU NA 02

Item Number: 5 **Accession Number:** 0M000502
Key: A
Classification Codes:
01 A 2 c CU NA 01

Item Number: 6 **Accession Number:** 1Y002380
Key: B
Classification Codes:
0 1 B 4 c CU NA 01

Item Number: 7 **Accession Number:** LQ000702
Key: NONE
Classification Codes:
01 A 4 e PS NA 01

Item Number: 8 **Accession Number:** LQ000705
Key: B
Classification Codes:
01 B 4 a PS NA 02

Item Number: 9 **Accession Number:** LQ000709
Key: C
Classification Codes:
01 D 3 b CU NA 01

Item Number: 10 **Accession Number:** XQ001390
Key: NONE
Classification Codes:
01 C 1 d EO NA NA

Print File: SlM9 Work Sheet: SlM9 6/3/1996 05:51 PM

Item Number: 1 Accession Number: LQ000698

How many fourths make a whole?

Answer: _____

Rationale Text:

Scoring Guide:

1 - Any incorrect response

7 - Correct responses - 4, or four fourths, or 4 fourths, etc.

Note: 4/3/96 Accepted 4c and 4b, but not 4 o'clock (placement in book confusing with next item about clocks)

Item Number: 7 Accession Number: LQ000702

Ms. Hernandez formed teams of 8 students each from the 34 students in her class. She formed as many teams as possible, and the students left over were substitutes. How many students were substitutes?

Answer: _____

Rationale Text:

Scoring Guide:

1 - Any incorrect response

7 - Correct response (2)

Note: 4 r 2 is incorrect response

Item Number: 10 Accession Number: XQO01390

In what ways are the figures above alike? List as many ways as you can.

In what ways are the figures above different? List as many ways as you can.

Rationale Text:

Solution:

The figures are alike because: (Do not accept: They both have lines that are straight:)

a. They both have 4 sides (or 4 corners or 4 angles)
b. They both have parallel sides.
c. They both have two sets of sides that are the same length.
d. They have the same area.
e. They have the same length. (Base)
f. They have the same height.
g. They both have little squares.

4 sides and 4 angles not considered different reasons.

The figures are different because: (Do not accept "They're not both the same shape.")

h. One has 4 equal angles and the other does not.
i. One has right angles or perpendicular lines and the other does not. (Students don't need to make the comparison, i.e., they can just say "one has 4 equal angles".)
j. One is "slantier" than the other (or one takes up full squares and the other does not).
k. They have different perimeters

Scoring Guide:

1. Incorrect response

2. A nonspecific response, i.e., the one on the right is skinner
   OR
   Only one correct reason (alike or different).

3. Student gives one correct reason alike and one correct reason different
   OR
   Two reasons alike
   OR
   Two reasons different

4. Student gives two reasons why the figures are alike and one reason why they are different
   OR
   One reason why they are alike and two reasons why they are different.

5. Student gives at least two reasons about why they are alike and at least two reasons about why they are different. (Two alike reasons are not both "a".)

Student Sample Responses

1. How many fourths make a whole?

Answer: 4

Level:
Complete (7)

1. How many fourths make a whole?

Answer: 1

Level:
Incorrect (1)

Student Sample Responses

7. Ms. Hernandez formed teams of 8 students each from the 34 students in her class. She formed as many teams as possible, and the students left over were substitutes. How many students were substitutes?

Answer: TWO

Level:
Complete (7)

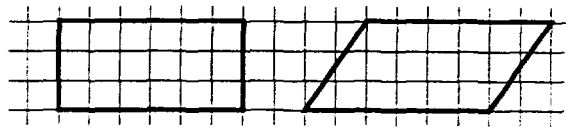
7. Ms. Hernandez formed teams of 8 students each from the 34 students in her class. She formed as many teams as possible, and the students left over were substitutes. How many students were substitutes?

Answer: 4 r 2

Level:
Incorrect (1)

Student Sample Responses

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above alike? List as many ways as you can.

They have 4 sides.

They have parll sides.

In what ways are the figures above different? List as many ways as you can.

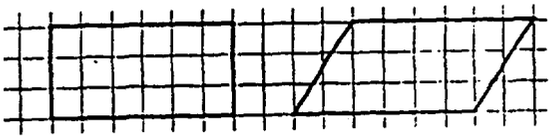
One has square corners.

One is more slant.

Level:
Extended (5)

Student Sample Responses

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above alike? List as many ways as you can.

Their the same legth. They have the same amount of room

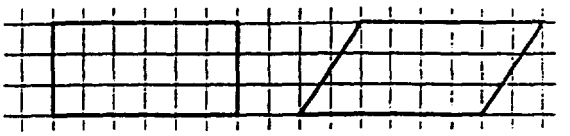
In what ways are the figures above different? List as many ways as you can.

They aren't the same shape. They don't have the same amount of full cubs.

Level:
Satisfactory (4)

Student Sample Responses

Think, carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above a like? List as many ways as you can.

On the top they both have lines that are Strait and they both have four corners

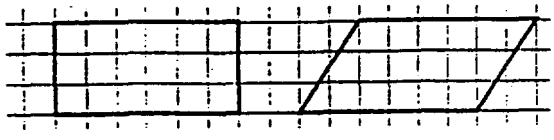
In what ways are the figures above different? List as many ways as you can.

wone has slanted lines and the other one doesn't and There not shaped the same way

Level:
Partial (3)

Student Sample Responses

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above alike? List as many ways as you can.

①They can both be square
②They can both be slanted
③They can both turn many ways

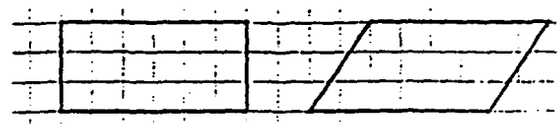
In what ways are the figures above different? List as many ways as you can.

①In the picture they are diferent.
②One is slanted.
③One is form and strate.

Level:
Minimal (2)

Student Sample Responses

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



10. In what ways are the figures above alike? List as many ways as you can.

They both go to the top and bot m

In what ways are the figures above different? List as many ways as you can.

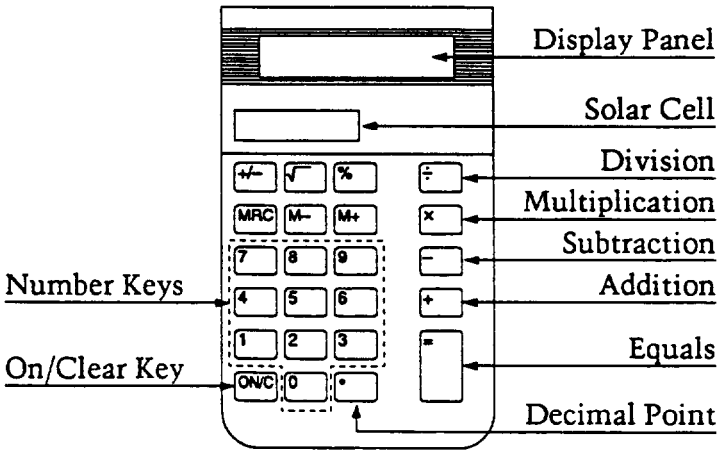
Level:
Incorrect (1)

SECTION 3

YOU WILL NEED A CALCULATOR FOR THIS SECTION.

REMEMBER: You will have to decide when to use the calculator. For some questions using the calculator is helpful, but for other questions the calculator may not be helpful. After each question you will be asked if you used the calculator.

Here is a picture of the calculator you will use. The keys you will need have been identified below.



HOW TO USE THE CALCULATOR

If you have used a calculator before, you should find this one easy to use. If you have not used a calculator before, the following directions will be helpful.

1. Turn on the calculator by pressing [ON/C]. (Do not cover the solar cell.) You should see [0.]. If you do not, raise your hand.

2. Push [1], then push [6]. You should see [16.].

3. Now Push [ON/C] twice. You should see [0.]. Pushing the [ON/C] button twice "clears" or "erases" the numbers you put in the calculator.

4. To enter one dollar twenty-five cents, push [1] [•] [2] [5]. You should see [1.25].

5. Push [ON/C] twice to clear. To divide 8 by 4, push [8] [÷] [4] [=] You should see [2.].

6. Push [ON/C] twice to clear. To compute 42 minus 12, push [4] [2] [−] [1] [2] [=]. You

ALWAYS REMEMBER TO PUSH [ON/C] TWICE BEFORE YOU START EACH PROBLEM.

GO ON TO THE NEXT PAGE

C Section 3

This part has 9 questions. Mark your answers in your booklet. You will have to fill in an oval or write your answer as directed. In those questions where you must write an answer, it is important that your answer be clear and complete and that you show all of your work since partial credit may be awarded. The last question may require 5 minutes or more to think about and answer. After each question, fill in the oval to indicate whether you used the calculator.

1. Kitty is taking a trip on which she plans to drive 300 miles each day. Her trip is 1,723 miles long. She has already driven 849 miles. How much farther must she drive?

Ⓐ 574 miles

Ⓑ 874 miles

Ⓒ 1,423 miles

Ⓓ 2,872 miles

APOO0533

Did you use the calculator on this question?

O Yes O No

2. A whole number is multiplied by 5. Which of these could be the result?

Ⓐ 652

Ⓑ 562

Ⓒ 526

Ⓓ 265

AP000517

Did you use the calculator on this question?

O Yes O No

GO ON TO THE NEXT PAGE

Martha planted 32 seeds. She put 8 seeds in each row. How many rows did she plant?

3. Which of the following could Martha use to solve the problem correctly?

Ⓐ 3 2 + 8

Ⓑ 3 2 - 8

Ⓒ 3 2 x 8

Ⓓ 3 2 - 8

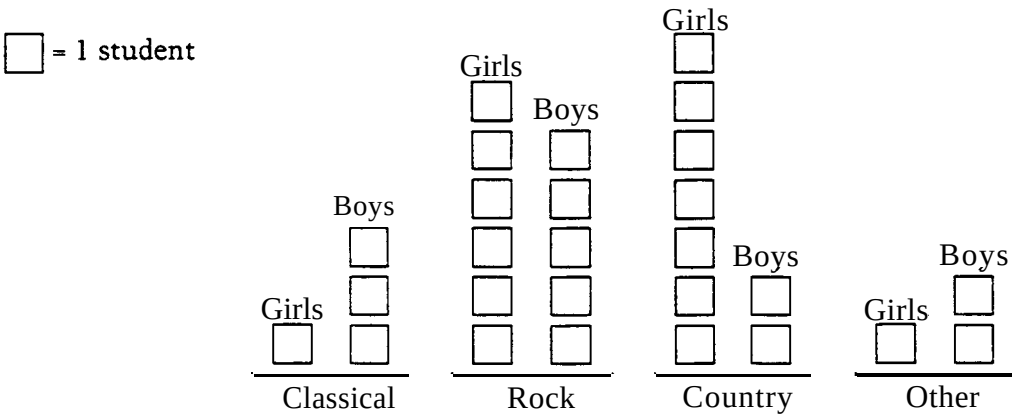
EL001535

Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE

4. Each boy and girl in the class voted for his or her favorite kind of music. Here are the results.



Which kind of music did most students in the class prefer?

Ⓐ Classical

Ⓑ Rock

Ⓒ Country

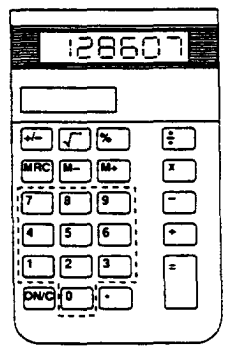
Ⓓ Other

AP000554

Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE



5. Mark tried to add the numbers 489 and 263 on his calculator. What is the sum of these numbers?

Answer: _____

The display on Mark's calculator showed his answer to be 128607. Mark had pressed a wrong key when trying to add. Which wrong key did he press?

Answer: _____ AP000539

Did you use the calculator on this question?

○ Yes ○ No

6. Every hour, a company makes 8,400 paper plates and puts them in packages of 15 plates each. How many packages are made in one hour?

Ⓐ 560

Ⓑ 8,385

Ⓒ 17,857

Ⓓ 126,000 EL001531

Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE

7. Sam can purchase his lunch at school. Each day he wants to have juice that costs 50¢, a sandwich that costs 90¢, and fruit that costs 35¢. His mother has only $1.00 bills. What is the least number of $1.00 bills that his mother should give him so he will have enough money to buy lunch for 5 days?

AP000522

Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE

8. Brett needs to cut a piece of string into four equal pieces without using a ruler or other measuring instrument.

Write directions to tell Brett how to do this.

EL001540

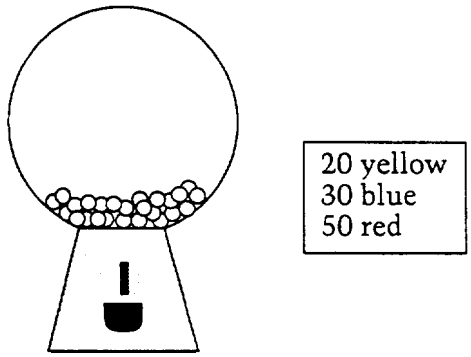
Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE

C Section 3

Think carefully about the following question. Write a complete answer. You may use drawings, words, and numbers to explain your answer. Be sure to show all of your work.



9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: _____ gum balls

Explain why you chose this number.

AP000528

Did you use the calculator on this question?

○ Yes ○ No

GO ON TO THE NEXT PAGE

If you need more room for your work, use the space below.

NAEP MATHEMATICS CLASSIFICATION CODES

Following this description of the Classification Codes, there is a single sheet with NAEP ID numbers, short descriptions of the items, item keys (1 -5 if the item is multiple-choice; blank if the item is open-ended), as well as the p-values for the items in the released block.

After the single sheet with NAEP IDs, there follows a 4-line listing of information about each of the items in the released blocks. If the item is open ended, the Key is given as either "NONE" or "See scoring guide." There are seven fields under the line "Classification Codes" in the listing of items. The fields areas follows:

Field 1: **AGE/GRADE CLASSIFICATION**

01 Grade 4
02 Grade 8
03 Grade 12

Field 2: **CONTENT AREA: A, B, C, D, E**

A Number Sense, Properties, and Operations
B Measurement
C Geometry
D Data Analysis, Statistics, and Probability
E Algebra and Functions

Field 3: **SUB-CONTENT AREA**

This category varies depending on the value in field 2. Possible choices are given below.

If field 2 is **A:** Number Sense, Properties, and Operations

1. Relate counting, grouping, and place value
2. Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols.
3. Compute with numbers (i.e., add, subtract, multiply, divide)
4. Use computation and estimation in applications
5. Apply ratios and proportional thinking in a variety of situations
6. Use elementary number theory

If field 2 is ***B:*** *Measurement*

1. Estimate the size of an object or compare objects with respect to a given attribute (e.g., length, area, capacity, volume, and weight/mass)
2. Select and use appropriate measurement instruments (e.g., manipulative such as ruler, meter stick, protractor. thermometer, scales for weight or mass, and gauges)
3. Select and use appropriate units of measurement, according to two criteria (type of unit; size of unit)

4. Estimate, calculate (using basic principles or formulas), or compare perimeter, area. volume, and surface area in meaningful contexts to solve mathematical and real-world problems
5. Apply given measurement formulas for perimeter, area column, and surface area in problem settings
6. Convert from one measurement to another within the same system (customary or metric)
7. Determine precision, accuracy, and error
8. Make and read scale drawings
9. Select appropriate methods of measurement (e.g. director indirect)
10. Apply the concept of rate to measurement situations

*If field 2 is **C:** Geometry*

1. Describe, visualize, draw, and construct geometric figures
2. Investigate and predict results of combining, subdividing, and changing shapes (e.g., paper folding, dissecting, tiling, and rearranging pieces of solids)
3. Identify the relationship (congruence, similarity) between a figure and its image under a transformation
4. Describe the intersection of two or more geometric figures
5. Classify figures in terms of congruence and similarity, and informally apply these relationships using proportional reasoning where appropriate
6. Apply geometric properties and relationships in solving problems
7. Establish and explain relationships involving geometric concepts
8. Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems
9. Represent geometric figures and properties algebraically using coordinates and vectors

*If field 2 is **D:** Data Analysis, Statistics, and Probability*

1. Read, interpret, and make predictions using tables and graphs
2. Organize and display data and make inferences
3. Understand and apply sampling, randomness, and bias in data collection
4. Describe measures of central tendency and dispersion in real-world situations
5. Use measures of central tendency, correlation, dispersion, and shapes of distributions to describe statistical relationships
6. Understand and reason about the use and misuse of statistics in our society
7. Fit a line or curve to a set of data and use this line or curve to make predictions about the data, using frequency distributions where appropriate
8. Design a statistical experiment to study a problem and communicate the outcomes
9. Use basic concepts, trees, and formulas for combinations, permutations, and other counting techniques to determine the number of ways an event can occur
10. Determine the probability of a simple event
11. Apply the basic concept of probability **to** real-world situations

*If field 2 is **E:** Algebra and Functions*

1. Describe, extend, interpolate, transform, and create a wide variety of patterns and functional relationships
2. Use multiple representations for situations to translate among diagrams, models, and symbolic expressions
3. Use number lines and rectangular coordinate systems as representational tools
4. Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems
5. interpret contextual situations and perform algebraic operations on real numbers and algebraic expressions to solve mathematical and real-world problems
6. Solve systems of equations and inequalities using appropriate methods
7. Use mathematical reasoning
8. Represent problem situations with discrete structures
9. Solve polynomial equations with real and complex roots using a variety of algebraic and graphical methods and using appropriate tools
10. Approximate solutions of equations (bisection, sign changes, and successive approximations)
11. Use appropriate notation and terminology to describe functions and their properties (including domain, range, function composition, and inverses)
12. Compare and apply the numerical, symbolic, and graphical properties of a variety of functions and families of functions, examining general parameters and their effect on curve shape
13. Apply function concepts to model and deal with real-world situations
14. Use trigonometry

Field 4: **SUBTOPIC:** a lowercase letter further describing the topic
For specifics, see the National Assessment Governing Board's *Mathematics Framework for the 1996 National Assessment of Educational Progress,* pp. 21-36.

Field 5: **MATHEMATICAL ABILITY/PROCESS:**
CU Conceptual Understanding
PK Procedural Knowledge
PS Problem Solving
EO Problem Solving with extended open-ended questions

Field 6: **MATHEMATICAL THEME:**
RE Reasoning
CM Communication
CN Connections

Field 7: **CALCULATOR ACTIVITY**

01 **inactive -** questions whose solution neither requires nor suggests the use of a calculator in fact, a calculator would be virtually useless as an aid to solving a problem.

02 **neutral -** questions in which the solution to the question does not require the use of a calculator. Given the option, some students might choose to use it for numerical computations.

03 **active -** questions that, by their nature, require calculator use; a student might find it impossible to solve the question without the aid of a calculator.

In any field: NA = Not Applicable, or Not Available

AS AN EXAMPLE, the classification below

02 El b CU RE 02

would be interpreted as follows:

Grade 8; Algebra and Functions; 1. Describe, extend, interpolate (etc.); b. Extend; Conceptual Understanding; Reasoning; Calculator neutral

1996 Mathematics Items

GRADE: 04 BLOCK: 27M12

ITEM	NAEP ID	SHORT DESCRIPTION	KEY	CONTENT	PROCESS	P-VALUE	RELEASE STATUS
1A	M068301	USE SUBTRACTION IN PROBLEM	2	1	2	0.642	P
2A	M068401	IDENTIFY MULTIPLE OF 5	4	1	1	0.537	P
3A	M068501	IDENTIFY SOLUTION FOR PROBLEM	4	1	1	0.482	P
4A	M068601	READ BAR GRAPH	2	4	2	0.590	P
5A	M068701	USE PLACE VALUE IN ADDITION		1	3	0.699	P
6A	M068801	SOLVE A DIVISION PROBLEM	1	1	2	0.495	P
7A	M068901	SOLVE A MULTI-STEP PROBLEM		1	3	0.268	P
8A	M069001	DESCRIBE MEASUREMENT TASK		2	3	0.228	P
9A	M069101	USE PROBABILISTIC REASONING (R1)		4	3	0.327	P

Content:
1 = Numbers & operations
2 = Measurement
3 = Geometry
4 = Data analysis, statistics & probability
5 = Algebra & functions

Process:
1 = Conceptual understanding
2 = Procedural knowledge
3 = Problem solving

Mathematics 1996 Grade 4 Block 27M12 A

04/05/97

Item Number 1 **Accession Number:** AP000533
Key: B
Classification Codes:
01 A 4 d PK RE 02

Item Number 2 **Accession Number:** AP000517
Key: D
Classification Codes:
01 A 6 NA CU RE 02

Item Number: 3 **Accession Number:** EL001535
Key: D
Classification Codes:
01 A 3 a CU RE 01

Item Number 4 **Accession Number:** AP000554
Key: B
Classification Codes:
01 D 1 a PK CN 01

Item Number 5 **Accession Number:** AP000539
Key: NONE
Classification Codes:
01 A 2 d PS RE 03

Item Number: 6 **Accession Number** EL001531
Key: A
Classification Codes:
01 A 4 d PK RE 02

Item Number 7 **Accession Number** AP000522
Key: NONE
Classification Codes:
01 A 4 a PS RECM 02

Item Number 8 **Accession Number** EL001540
Key: NONE
Classification Codes:
01 B 9 NA PS RECMCN 01

Item Number 9 **Accession Number:** AP000528
Key: NONE
Classification Codes:
01 D 10 b EO RE NA

Item Number: 5 Accession Number: AP000539

Key: NONE

Classification Codes:
N25M 1 A 02 d PS RE 03

Open Codes: AF2 NA NA 3

Rationale Text:

SOLUTION:

Mark must have pushed the x key instead of the + key, because 489 X 263 = 128,607. The correct answer should be 752. ("Seven five two" is acceptable.)

SCORING GUIDE:

1. Incorrect response

2. Indicates multiplication or that correct answer is 752 but not both. Includes 752 on the wrong line.

3. Correct response (includes correct answers, but reversed)

Item Number: 7 Accession Number: AP000522

Key: NONE

Classification Codes:
N25M 1 A 04 a PS RECM 02

Open Codes: NA NA NA 3

Rationale Text:

SOLUTION:

For one day, the sum is $1.75. For 5 days, the sum is $8.75. Therefore, he should ask his mother for nine one-dollars bills (or 1 $5 bill and 4 $1 bills) .

Answer may be given pictorially.

Note: No explanation is asked for, so paper could have small error, such as copying a number incorrectly and still get a score of 3, provided method and answer are correct.

SCORING GUIDE:

1. Incorrect response -- includes $1.75 or $2; also $875 or $875.00

2. $8.75 or 875
   OR
   One day is $1.75 so he needs $2 each day, so $10 for a week
   (picture of $10 bill is acceptable)
   OR
   correct method but rounded down to $8 (this requires work to be shown)
   OR
   correct method but small error and incorrect response of $7 to $11, inclusive

3. Correct response

Item Number: 8 Accession Number: EL001540

Key: NONE

Classification Codes:
N25M 1 B 09 NA PS RECMCN 01

Open Codes: NA NA NA 3

Rationale Text:

SOLUTION:

Fold the string in half and cut it. Then fold each piece in half and cut them.

SCORING GUIDE:

1. Incorrect response (includes “fold the string”)

2. Mentions folding once (in half); e.g., fold the string and cut
   OR
   Cut in the middle and do that to the pieces.
   OR
   Indicates how to get 3 more equal pieces once the first piece is made.

3. Correct response

Item Number: 9 Accession Number: AP000528

The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: _____ gum balls

Explain why you chose this number.

_____

_____

_____

_____

_____

_____

Rationale Text:

SOLUTION:

5 gum balls would probably be red. Half of the 100 gum balls in the machine are red, so half of what she gets out should be red.
Answers such as 4 or 6 are acceptable if explanation is correct.

A less correct explanation: There are more reds in the machine so more reds would come out.

Also acceptable: 5 because 10 percent of 50 is 5
(and 10 is 10 percent of 100)
5 because 50 divided by 10 is 5

SCORING GUIDE:

1. Incorrect response

2. Answers greater than 10 or no number with explanation that there are more red gumballs.

3. Answers 3-7 with no explanation or insufficient explanation
OR
Answers 1-2 or 8-10 gumballs with explanation that there are more red gumballs.

4. Answers 4-6 gumballs with explanation that there are more red gumballs than any other color.

5. Correct response [4-6 gumballs
Half of the gumballs are red]

*Numerical Answer	Possible Score (depends on explanation)
1	1 or 3
2	1 or 3
3	3
4, 5, 6	3, 4, or 5
7	3
8, 9, 10	1 or 3
greater than 10	1 or 2
no number given	1 or 2

*Non-integer answer treated as a range (e.g., 3.5 is scored as 3 to 4). Range scored according to worst answer (e.g., 3 to 4 scored as 3.).

Student Sample Responses

5. Mark tried to add the numbers 489 and 263 on his calculator. What is the sum of these numbers?

Answer: 752

The display on Mark's calculator showed his answer to be 128607. Mark had pressed a wrong key when trying to add. Which wrong key did he press?

Answer: X

Did you use the calculator on this question?

● Yes ○ No

Level:
Complete (3)

5. Mark tried to add the numbers 489 and 263 on his calculator. What is the sum of these numbers?

Answer: 226

The display on Mark's calculator showed his answer to be 128607. Mark had pressed a wrong key when trying to add. Which wrong key did he press?

Answer: The times (×) button

Did you use the calculator on this question?

● Yes ○ No

Level:
Partial (2)

Student Sample Responses

5. Mark tried to add the numbers 489 and 263 on his calculator. What is the sum of these numbers?

Answer: 226

The display on Mark's calculator showed his answer to be 128607. Mark had pressed a wrong key when trying to add. Which wrong key did he press?

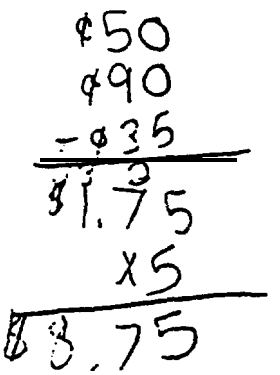
Answer: 479

Did you use the calculator on this question?

● Yes ○ No

Level:
Incorrect (1)

7. Sam can purchase his lunch at school. Each day he wants to have juice that costs 50c, a sandwich that costs 90c, and fruit that costs 35c. His mother has only $1.00 bills. What is the least number of $1.00 bills that his mother should give him so he will have enough money to buy lunch for 5 days?



9 dollar bills

Did you use the calculator on this question?

○ Yes ● No

Level:
Complete (3)

Student Sample Responses

7. Sam can purchase his lunch at school. Each day he wants to have juice that costs 50c, a sandwich that costs 90c, and fruit that costs 35c. His mother has only $1.00 bills. What is the least number of $1.00 bills that his mother should give him so he will have enough money to buy lunch for 5 days? $9.75

Did you use the calculator on this question?

● Yes ○ No

Level:
Partial (2)

7. Sam can purchase his lunch at school. Each day he wants to have juice that cows 50¢, a sandwich that costs 90¢, and fruit that costs 35¢. His mother has only $1.00 bills. What is the least number of $1.00 bills that his mother should give him so he will have enough money to buy lunch for 5 days?

She should give him $1.75 each day. for the whole week.

Did you use the calculator on this question?

● Yes ○ No

Level:
Incorrect (1)

Student Sample Responses

8. Brett needs to cut a piece of suing into four equal pieces without using a ruler or other measuring instrument.

Write directions to tell Brett how to do this.

Fold it untell the makes two equal parts cut it. Then fold it again cut it.

Did you use the calculator on this question?

○ Yes ● N o

Level:
Complete (3)

8. Brett needs to cut a piece of string into Four equal pieces without using a ruler or other measuring instrument.

Write directions to tell Brett how to do this.

Cut them in half
put them sid by side and cut again

Did you use the calculator on this question?

○ Yes ● No

Level:
Partial (2)

Student Sample Responses

8. Brett needs to cut a piece of string into four equal pieces without using a ruler or ocher measuring instrument.

Write directions to tell Brett how to do this.

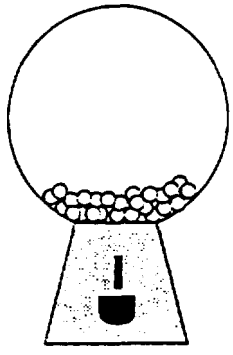
Brett can use his finger to measure the peice of string. He could put his finger down and mark it at the end then cut on the line

Did you use the calculator on this question?

○ Yes ● No

Level:
Incorrect (1)

Student Sample Responses



20 yellow
30 blue
50 red

9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: 5 gum balls

Explain why you chose this number.

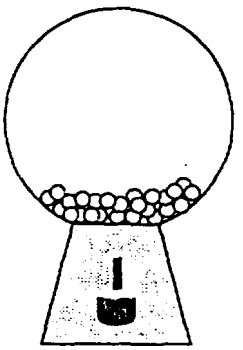
because red has the biggest number 50 and 10 ÷ 2 is 5 so 20 + 20 = 50 and the rest would be blue and yellow

Did you use the calculator on this question?

○ Yes ● No

Level:
Extended (5)

Student Sample Responses



20 yellow 30 blue 50 red

9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: 5 gum balls

Explain why you chose this number.

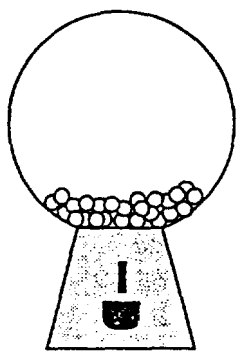
Because there are more red gumballs. Also because there are 50 red gumballs, 20 yellow gumballs and 30 blue gumbal

Did you use the calculator on this question?

○ Yes ● No

Level:
Satisfactory (4)

Student Sample Responses



20 yellow
30 blue
50 red

9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: 6 gum balls

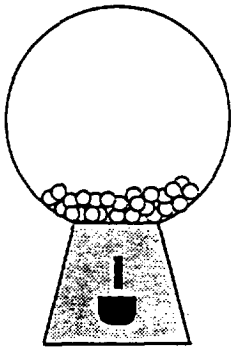
Explain why you chose this number.

because Theat are so red. 20 are yellow 30 are blue.

Did you use the calculator on this question?

○ Yes ● No

Level:
Partial (3)



20 yellow
30 blue
50 red

9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: red gum balls

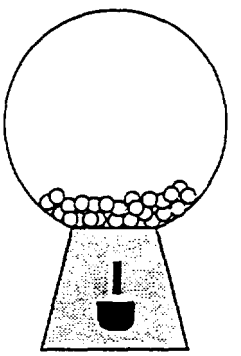
Explain why you chose this number.

Red has the most the most colored gum balls.

Did you use the calculator on this question?

○ Yes ● No

Level:
Minimal (2)



20 yellow
30 blue
50 red

9. The gum ball machine has 100 gum balls; 20 are yellow, 30 are blue, and 50 are red. The gum balls are well mixed inside the machine.

Jenny gets 10 gum balls from this machine.

What is your best prediction of the number that will be red?

Answer: 2 red gum balls

Explain why you chose this number.

The average number of gum balls is 100. There is only 2 ways you can get to red gumballs because it is well mixed

Did you use the calculator on this question?

● Yes ○ No

Level:
Incorrect (1)

SECTION 4

This part has 6 questions. Mark your answers in your book. You will have to fill in-an oval or 'write your answer as directed. "

With this test booklet you will receive a packet of 6 pieces: 2 each of shape *N*, shape *P*, and shape *Q*. You will use these pieces in answering some of the questions. You can turn the pieces in any way or flip them over. You may use drawings to help explain your answers.

▶ **Questions 1-6** refer to shapes *N*, *P*, and *Q*.

Please remove the 6 pieces from your packet and put them on your desk.

1. Laura was asked to choose 1 of the 3 shapes *N*, *P*, and *Q* that is different from the other 2. Laura chose shape *N*. Explain how shape *N* is different from shapes *P* and *Q*.

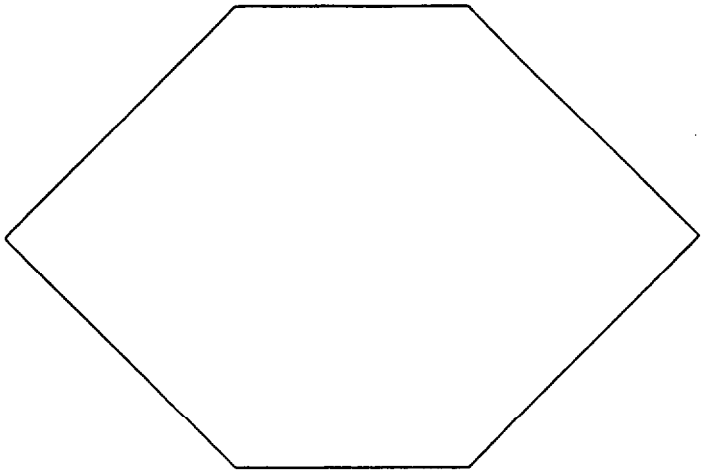
Answer: _____

_____

_____ M000613

2. For this question you will need some of the pieces labeled *N, P,* and *Q.*

Use 4 of the 6 pieces labeled *N, P,* and *Q* to make the shape shown below. Draw the lines to show where the pieces meet and label the pieces.



M000621

GO ON TO THE NEXT PAGE

3. You will need the 2 pieces labeled *Q*. Please find those 2 pieces now.

   Use the 2 pieces labeled *Q* to make a square. Trace the square and draw the line to show where the 2 pieces meet.

M000618

GO ON TO THE NEXT PAGE

4. Use the 2 pieces labeled *Q* to make a 4-sided shape that is not a square. Trace the shape and draw the line to show where the 2 pieces meet.

MOO0619

GO ON TO THE NEXT PAGE

5. This question refers to pieces N, P, and Q.

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

	Class 1	Class 2	Class 3
Shape N	9	14	11
Shape P	1	9	17
Shape Q	22	7	2

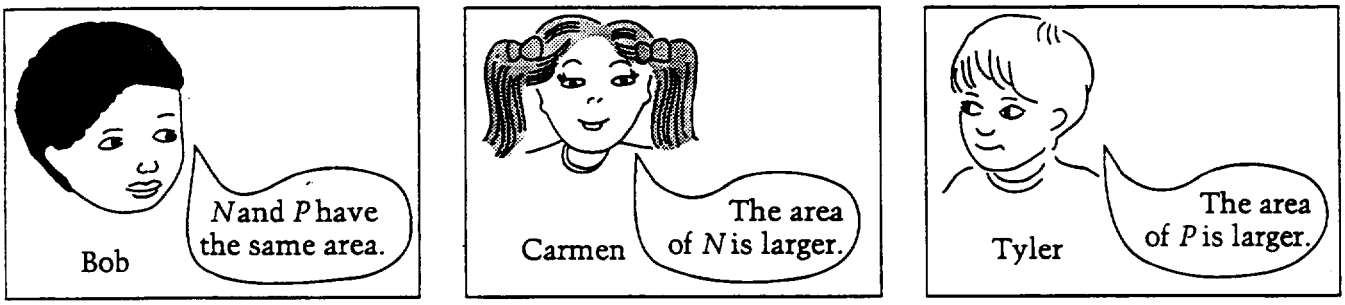
Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select: _____

Explain:

M000622

6. Bob, Carmen, and Tyler were comparing the areas of *N* and *P*.



Who was correct ? _____

Use pictures and words to explain why.

M000728

GO ON TO THE NEXT PAGE

Please put the 6 pieces labeled *N*, *P*, and *Q* back in your packet.

NAEP MATHEMATICS CLASSIFICATION CODES

Following this description of the Classification Codes, there is a single sheet with NAEP ID numbers, short descriptions of the items, item keys (1 -5 if the item is multiple-choice; blank if the item is open-ended), as well as the p-values for the items in the released block.

After the single sheet with NAEP IDs, there follows a 4-line listing of information about each of the items in the released blocks. If the item is open ended, the Key is given as either "NONE" or "See scoring guide." There are seven fields under the line "Classification Codes" in the listing of items. The fields areas follows:

Field 1: **AGE/GRADE CLASSIFICATION**

01 Grade 4
02 Grade 8
03 Grade 12

Field 2: **CONTENT AREA: A, B, C, D, E**

A Number Sense, Properties, and Operations
B Measurement
C Geometry
D Data Analysis, Statistics, and Probability
E Algebra and Functions

Field 3: **SUB-CONTENT AREA**

This category varies depending on the value in field 2. Possible choices are given below.

*If field 2 is **A:*** Number Sense, Properties, and Operations

1. Relate counting, grouping, and place value
2. Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols.
3. Compute with numbers (i.e., add, subtract, multiply, divide)
4. Use computation and estimation in applications
5. Apply ratios and proportional thinking in a variety of situations
6. Use elementary number theory

*If field 2 is **B:** Measurement*

1. Estimate the size of an object or compare objects with respect to a given attribute (e.g., length, area, capacity, volume, and weight/mass)
2. Select and use appropriate measurement instruments (e.g., manipulative such as ruler, meter stick, protractor, thermometer, scales for weight or mass, and gauges)
3. Select and use appropriate units of measurement, according to two criteria (type of unit; size of unit)

4. Estimate, calculate (using basic principles or formulas), or compare perimeter, area, volume, and surface area in meaningful contexts to solve mathematical and real-world problems
5. Apply given measurement formulas for perimeter, area, column, and surface area in problem settings
6. Convert from one measurement to another within the same system (customary or metric)
7. Determine precision, accuracy, and error
8. Make and read scale drawings
9. Select appropriate methods of measurement (e.g. director indirect)
10. Apply the concept of rate to measurement situations

*If field 2 is **C:** Geometry*

1. Describe, visualize, draw, and construct geometric figures
2. Investigate and predict results of combining, subdividing, and changing shapes (e.g., paper folding, dissecting, tiling, and rearranging pieces of solids)
3. Identify the relationship (congruence, similarity) between a figure and its image under a transformation
4. Describe the intersection of two or more geometric figures
5. Classify figures in terms of congruence and similarity, and informally apply these relationships using proportional reasoning where appropriate
6. Apply geometric properties and relationships in solving problems
7. Establish and explain relationships involving geometric concepts
8. Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems
9. Represent geometric figures and properties algebraically using coordinates and vectors

*If field 2 is **D:** Data Analysis, Statistics, and Probability*

1. Read, interpret, and make predictions using tables and graphs
2. Organize and display data and make inferences
3. Understand and apply sampling, randomness, and bias in data collection
4. Describe measures of central tendency and dispersion in real-world situations
5. Use measures of central tendency, correlation, dispersion, and shapes of distributions to describe statistical relationships
6. Understand and reason about the use and misuse of statistics in our society
7. Fit a line or curve to a set of data and use this line or curve to make predictions about the data using frequency distributions where appropriate
8. Design a statistical experiment to study a problem and communicate the outcomes
9. Use basic concepts, trees, and formulas for combinations, permutations, and other counting techniques to determine the number of ways an event can occur
10. Determine the probability of a simple event
11. Apply the basic concept of probability to real-world situations

*If field 2 is **E:** Algebra and Functions*

1. Describe, extend, interpolate, transform, and create a wide variety of patterns and fictional relationships
2. Use multiple representations for situations to translate among diagrams, models, and symbolic expressions
3. Use number lines and rectangular coordinate systems as representational tools
4. Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems
5. Interpret contextual situations and perform algebraic operations on real numbers and algebraic expressions to solve mathematical and real-world problems
6. Solve systems of equations and inequalities using appropriate methods
7. Use mathematical reasoning
8. Represent problem situations with discrete structures
9. Solve polynomial equations with real and complex roots using a variety of algebraic and graphical methods and using appropriate tools
10. Approximate solutions of equations (bisection, sign changes, and successive approximations)
11. Use appropriate notation and terminology to describe functions and their properties (including domain, range, function composition, and inverses)
12. Compare and apply the numerical, symbolic, and graphical properties of a variety of functions and families of functions, examining general parameters and their effect on curve shape
13. Apply function concepts to model and deal with real-world situations
14. Use trigonometry

Field 4: **SUBTOPIC:** a lower case letter further describing the topic
For specifics, see the National Assessment Governing Board's *Mathematics Framework for the 1996 National Assessment of Educational Progress, pp. 21-36.*

Field 5: **MATHEMATICAL ABILITY/PROCESS:**
CU Conceptual Understanding
PK Procedural Knowledge
PS Problem Solving
EO Problem Solving with extended open-ended questions

Field 6: **MATHEMATICAL THEME:**
RE Reasoning
CM Communication
CN Connections

Field 7: **CALCULATOR ACTIVITY**

01 **inactive -** questions whose solution neither requires nor suggests the use of a calculator; in fact, a calculator would be virtually useless as an aid to solving a problem.

02 **neutral** - questions in which the solution to the question does not require the use of a calculator. Given the option, some students might choose to use it for numerical computations.

03 **active -** questions that, by their nature, require calculator use; a student might find it impossible to solve the question without the aid of a calculator.

In any field: NA = Not Applicable, or Not Available

AS AN EXAMPLE, the classification below

02 E l b CU RE 02

would be interpreted as follows:

Grade 8; Algebra and Functions; 1. Describe, extend, interpolate (etc.); b. Extend; Conceptual Understanding; Reasoning; Calculator neutral

1996 Mathematics Items

GRADE: 04 BLOCK: 27M10

ITEM	NAEP ID	SHORT DESCRIPTION	KEY	CONTENT	PROCESS	P-VALUE	RELEASE STATUS
1A	M061901	COMPARE GEOMETRIC SHAPES	3	3	1	0.637	P
2A	M061902	ASSEMBLE PIECES TO FORM SHAPE	2-3	3	3	0.526	P
3A	M061903	ASSEMBLE PIECES TO FORM SHAPE	2	3	3	0.729	P
4A	M061904	ASSEMBLE PIECES TO FORM SHAPE	2-3	3	3	0.154	P
5A	M061905	USE DATA FROM A CHART	4	4	3	0.571	P
6A	M061906	COMPARE AREAS OF TWO SHAPES	3	2	3	0.159	P

Content:
1 = Numbers & operations
2 = Measurement
3 = Geometry
4 = Data analysis, statistics & probability
5 = Algebra & functions

Process:
1 = Conceptual understanding
2 = Procedural knowledge
3 = Problem solving

Mathematics 1996 Grade 4 Block 27M10 A

04/05/97

Item Number: 1 **Accession Number:** OM000613
Key: NONE
Classification Codes:
01 C 1 d CU NA 01

Item Number: 2 **Accession Number:** OM000621
Key: NONE
Classification Codes:
01 C 3 NA PS NA 01

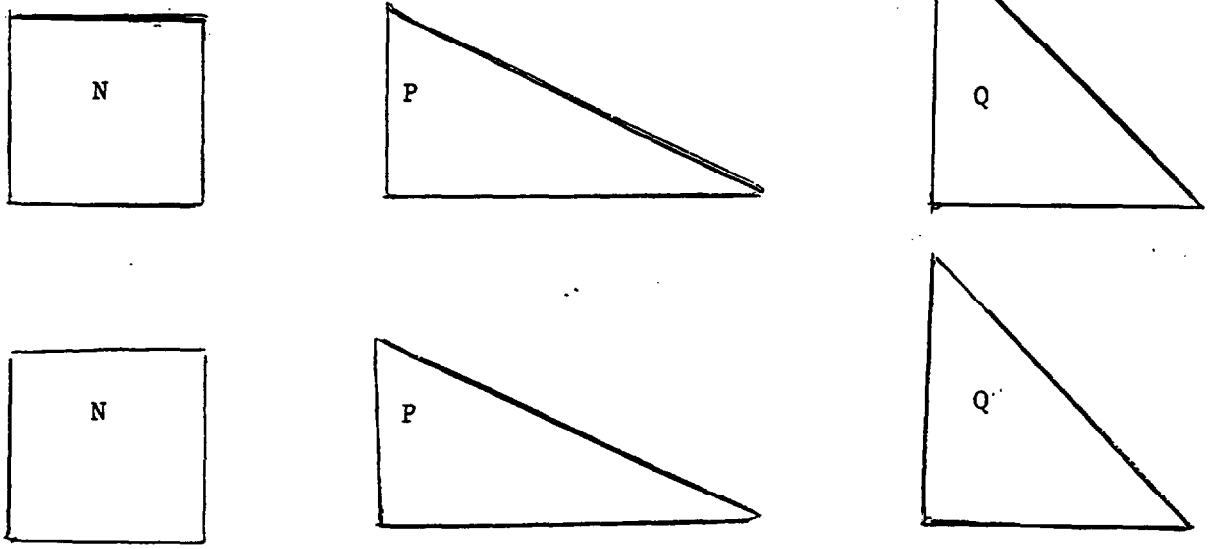
Item Number: 3 **Accession Number:** OM000618
Key: NONE
Classification Codes:
01 C 3 NA PS NA 01

Item Number: 4 **Accession Number:** OM000619
Key: NONE
Classification Codes:
01 C 3 NA PS NA 01

Item Number: 5 **Accession Number:** OM000622
Key: NONE
Classification Codes:
01 D 1 c PS NA 02

Item Number: 6 **Accession Number:** OM000728
Key: NONE
Classification Codes:
01 B NA NA PS NA NA

Grade 4- Block 10
"Shapes"



Item Number: 1 Accession Number: OM000613

Key: NONE

Classification Codes:
N23M 01 C 01 d CU 04 01

Open Codes: NA NA NA NA

Rationale Text:

Solution:

N is a square (but P and Q are triangles.)

OR N has four sides, (or vertices or points or angles), (but P and Q each have 3) .

OR All the sides of N are =, (but not so with P and Q).

OR All the angles of N are **=** (or, all right angles), (not so with P and Q.)

Must mention both P and Q or neither P nor Q plus N is a square or give other characteristics of N.

Note to scorers:

- Areas of N, P, Q are equal
  "It" or "they" is assumed to refer to N.
- Use of the word "box" instead of "square" is not acceptable

Scoring Guide:

1 **-** Any incorrect response other than as described in 2.

Not acceptable: N is bigger
N is prettier

2 **-** Response refers to the letters (N, P, or Q) , rather than to the shape.

7 **-** Correct responses

Compare geometric shapes
Compare geometric shapes

Item Number: 2 Accession Number: OM000621

For this question you will need some of the pieces labeled *N, P,* and *Q.*

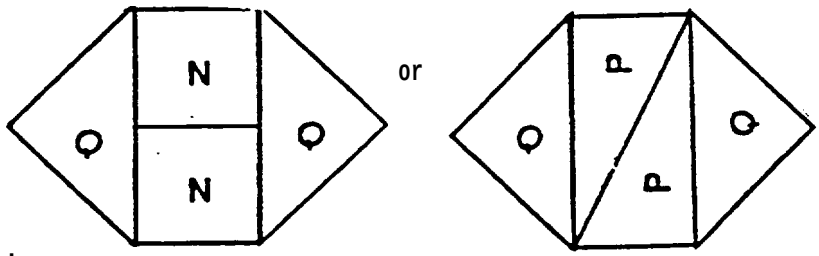
Use 4 of the 6 pieces labeled *N, P,* and *Q* to make the shape shown below. Draw the lines to show where the pieces meet and label the pieces.

Rationale Text:

Solution:

6 - Lines are drawn correctly but labels are incorrect or missing.

7 - The second figure may be reversed left to right.
Pieces must be labeled correctly.
Accept even if there is space between pieces.



Scoring Guide:

1 - Any incorrect response

6 – Correct response

7 - Correct response

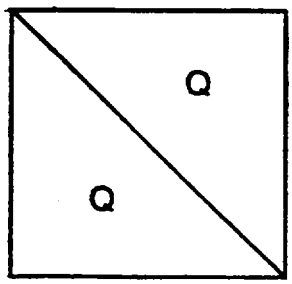
Item Number: 3 Accession Number: OM000618

You will need the 2 pieces labeled Q. Please find those 2 pieces now.

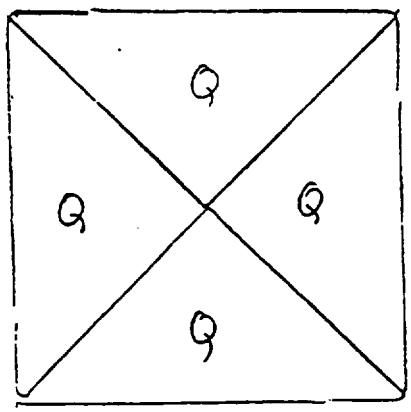
Use the 2 pieces labeled Q to make a square. Trace the square and draw the line to show where the 2 pieces meet.

Rationale Text:
Solution:

The square may be tilted.
Diagonal must be shown.
Pieces may or may not be labeled.



Space between is acceptable.
Freehand drawings are acceptable.



Acceptable

Scoring Guide:

1 - Any incorrect response

7 - Correct response

Item Number: 4 Accession Number: OM000619

Use the 2 pieces labeled Q to make a 4-sided shape that is not a square. Trace the shape and draw the line to show where the 2 pieces meet.

Rationale Text:

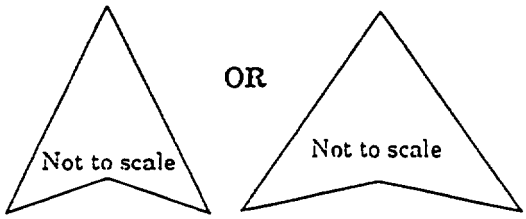
Solution:

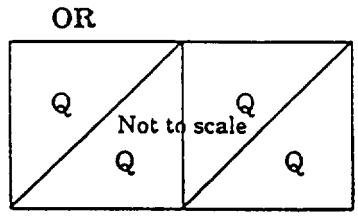
6 - A correct shape without the line of separation shown.
(Figure is not a rhombus.)

OR

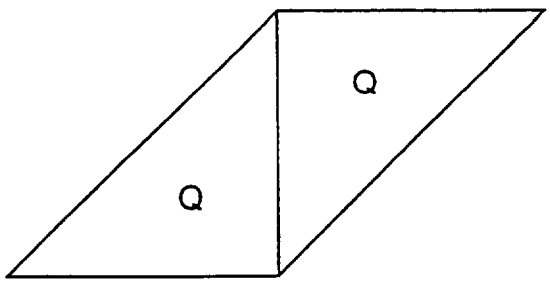
A 4-sided shape (that is not a square) that results when part of two Q shapes overlap.

Examples:





7 - The figure may be tilted.
Pieces may or may not be labeled.
Line of separation must be shown.



Space between pieces is acceptable.
Freehand drawings are acceptable.

Scoring Guide:

1 - Any incorrect response

6 - Correct response

7 - Correct response

Item Number: 5 Accession Number: OM000622

This question refers to pieces *N, P,* and *Q.*

In Mr. Bell's classes, the students voted for their favorite shape for a symbol . Here are the results.

	Class 1	Class 2	Class 3
Shape *N*	9	14	11
Shape *P*	1	9	17
Shape *Q*	22	7	2

Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select:

Explain:

Rationale Text:

Solution:

N, because more students chose it.

OR

N, because it was first choice in one class and second choice in the other classes.

"Majority" is acceptable (taken to mean most.) If student says the most classes , do not accept.

Scoring Guide:

1 - Any incorrect response other than those described in 2 and 3.

2 - Piece N chosen, but explanation not given or is inadequate with incorrect computation.

3 - Piece Q chosen, with an explanation that refers to a number of votes .

7 - Correct responses

Item Number: 6 Accession Number: OM000728

Bob, Carmen, and Tyler were comparing the areas of N and ***P.***

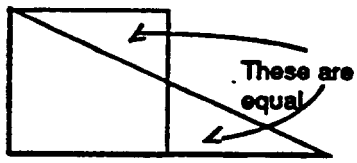
Who was correct?

Use pictures and words to explain why.

Rationale Text:

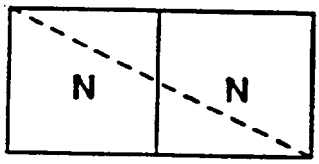
Solution:

An adequate explanation with or without Bob.
May say “neither” or “both”.



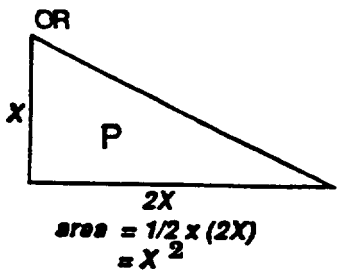
Parts of P overlaps N, and part sticks out. The sticking out part is equal to the left out part of N.

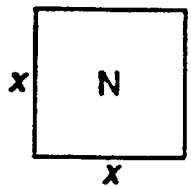
OR



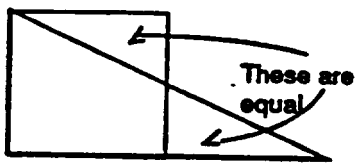
Two P’s match two N’s therefore they have the same area. (Therefore, one N has the same area as one P.)

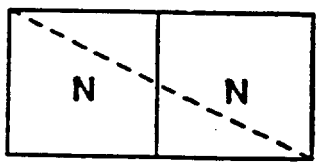
OR





Areas are equal because height of P is the same as the height of N, and the base of P is twice the base of N.





Either of these two figures alone are acceptable.

Scoring Guide:

1 - Any response that answers Carmen or Tyler to “Who was correct?” or omits the name and gives no satisfactory explanation.

2 - Bob was correct, but explanation not given or inadequate.

7 - Correct responses

In this block, some questions appeared at more than one grade. However, unlike in other blocks of the assessment, cross-grade questions in this block may have appeared in different positions at different grade levels. This explains why the numbering of the student responses that are illustrated here seems inconsistent. (Responses for each cross-grade question in all blocks of the assessment were scored using the same rubric for all grades at which that question appeared.)

Student Sample Responses

In block 10, questions common to more than one grade appeared in different positions at each grade.

▶ Questions 1-7 refer to shapes *N*, *P*, and *Q*.

1. Laura was asked to choose 1 of the 3 shapes *N*, *P*, and *Q* that is different from the other 2. Laura chose shape N. Explain how shape *N* is different from shapes *P* and *Q*.

Answer: has four sides

Level:
Complete (7)

1. Laura was asked CO choose 1 of the 3 shapes *N*, *P*, and *Q* that is different from the other 2. Laura chose shape *N*. Explain how shape *N* is different from shapes *P* and *Q*.

Answer: N is not round anywhere on the letter

Level:
Incorrect (2)

1. Laura was asked to choose 1 of the 3 shapes *N*, *P*, and *Q* that is different from the other 2. Laura chose shape N. Explain how shape *N* is different from shapes *P* and *Q*.

Answer: N shape is square and the other two are rectangles

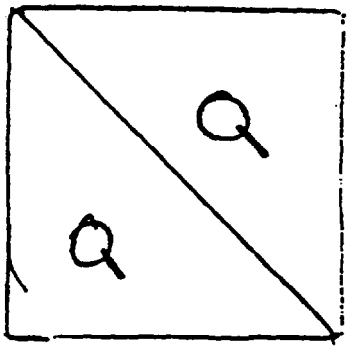
Level:
Incorrect (1)

Student Sample Responses

2. You will need the *2* pieces labeled *Q*. Please find those 2 pieces now.

Use the 2 pieces labeled *Q* to make a square Trace the square and draw the line to show where the *2* pieces meet.

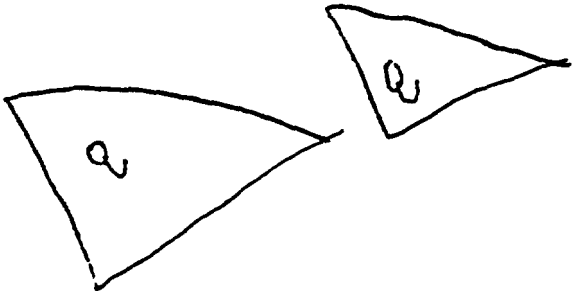
Level:
Complete (7)



3. You will need the 2 pieces labeled *Q*. Please find those 2 pieces now.

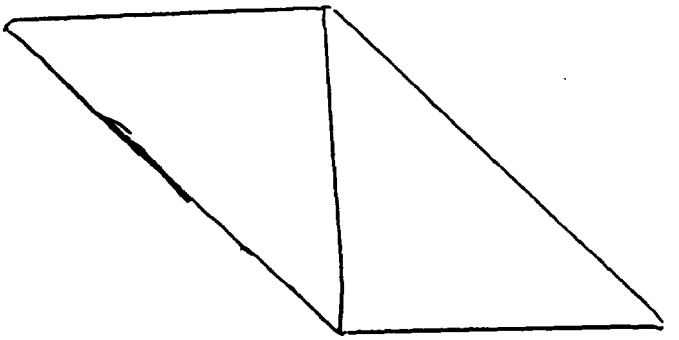
Use the 2 pieces labeled *Q* to make a square. Trace the square and draw the line to show where the 2 pieces meet.

Level:
Incorrect (1)



Student Sample Responses

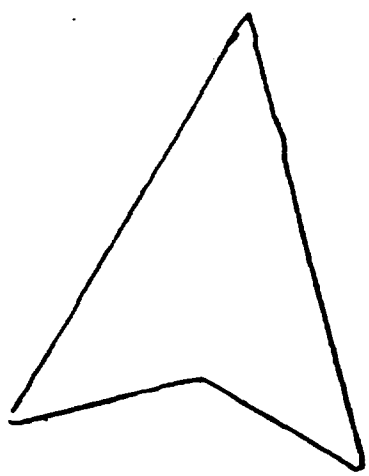
3. Use the 2 pieces labeled *Q* to make a 4-sided shape that is not a square. Trace the shape and draw the line to show where the 2 pieces meet.



Level:
Complete (7)

Student Sample Responses

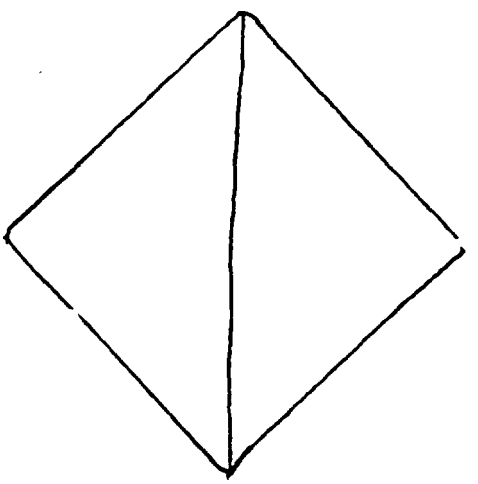
3. Use the 2 pieces labeled *Q* to make a 4-sided shape that is not a square. Trace the shape and draw the line to show where the 2 pieces meet.



Level:
Complete (6)

Student Sample Responses

2. Use the 2 pieces labeled *Q* to make a 4-sided shape that is not a square. Trace the shape and draw the line to show where the 2 pieces meet.

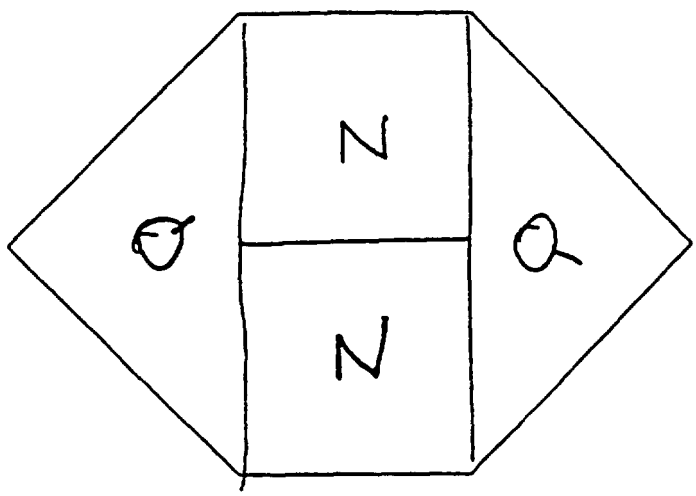


Level:
Incorrect (1)

Student Sample Responses

4. For this question you will need some of the pieces labeled *N*, *P*, and *Q*.

Use 4 of the 6 pieces labeled *N*, *P*, and *Q* to make the shape shown below. Draw the lines to show where the pieces meet and label the pieces.

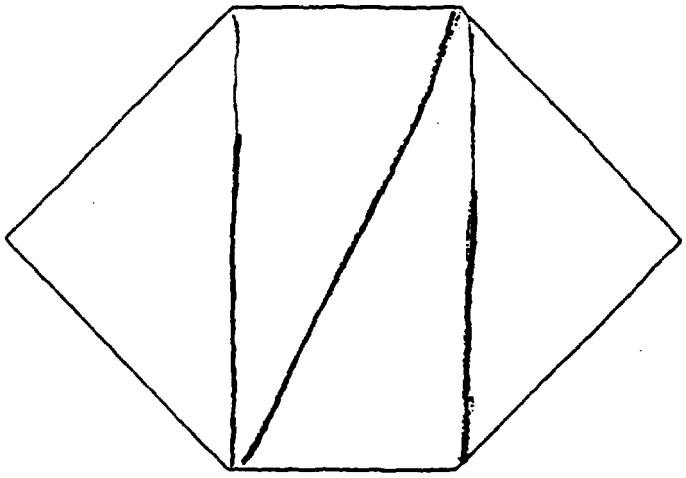


Level:
Complete (7)

Student Sample Responses

4. For this question you will need some of the pieces labeled *N*, *P*, and *Q*.

Use 4 of the 6 pieces labeled *N*, *P*, and *Q* to make the shape shown below. Draw the lines to show where the pieces meet and label the pieces.

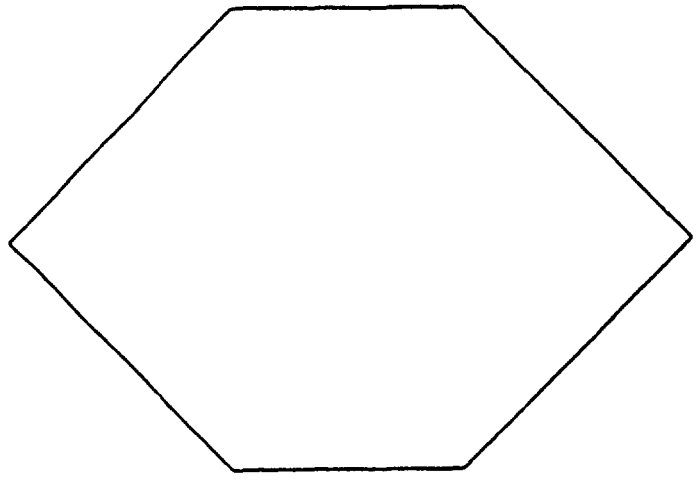


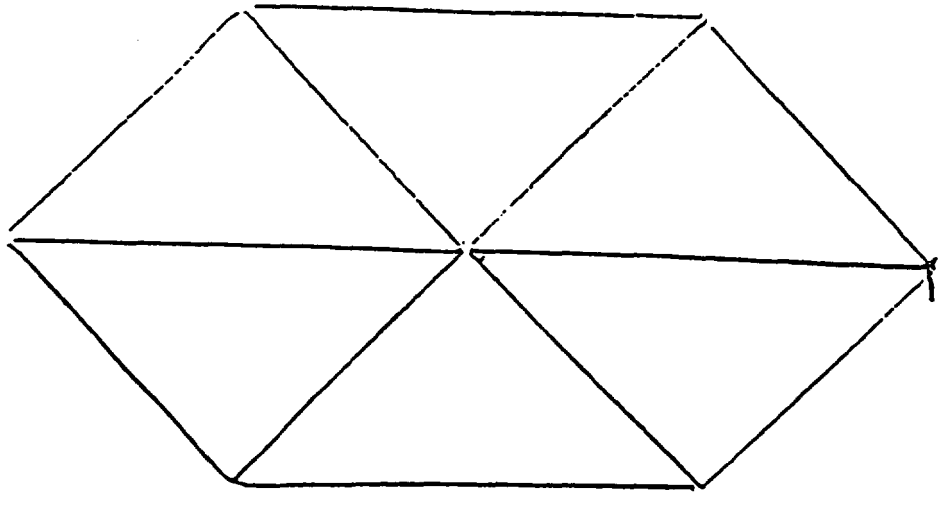
Level:
Complete (6)

Student Sample Responses

4. For this question you will need some of the pieces labeled *N, P,* and *Q*.

Use 4 of the 6 pieces labeled *N, P,* and *Q* to make the shape shown below. Draw the lines to show where the pieces meet and label the pieces.





Level:
Incorrect (1)

Student Sample Responses

3. Bob, Carmen, and Tyler were comparing the areas of *N* and *P*. Bob said that *N* and *P* have the same area. Carmen said that the area of *N* is larger. Tyler said that the area of *P* is larger.

Who was correct? Bob

Use words or pictures (or both) to explain why.

because n has 4 right sides

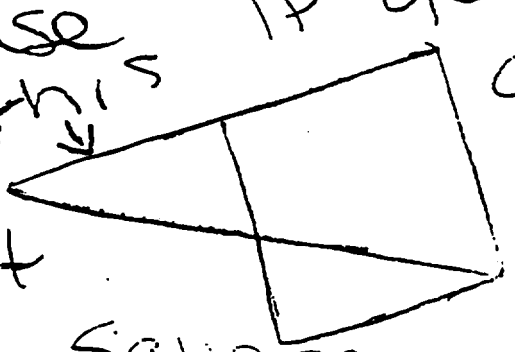
Level:
Incorrect (2)

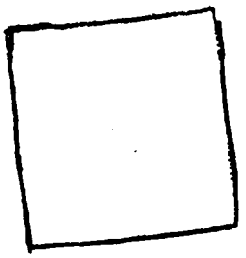
5. Bob, Carmen, and Tyler were comparing the areas of *N* and *P*. Bob said that *N* and *P* have the same area. Carmen said that the area of *N* is larger. Tyler said that the area of *P* is larger.

Who was correct? Bob

Use words or pictures (or both) to explain why.

Because if you were to take this and fold it over, it would all be a square





Level:
Complete (7)

Student Sample Responses

5. Bob, Carmen, and Tyler were comparing the areas of *N* and *P*. Bob said that *N* and *P* have the same area. Carmen said that the area of *N* is larger. Tyler said that the area of *P* is larger.

Who was correct? Carmen

Use words or pictures (or both) to explain why.

if you fold over P it is smaller than N. N is bigger

Level:
Incorrect (1)

Student Sample Responses

5. This question refers to pieces *N*, *P*, and *Q*.

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

	Class 1	Class *2*	Class 3
Shape *N*	9	14	11
Shape *P*	1	9	17
Shape *Q*	22	7	2

Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select: N

Explain:

N: 14, 11, 9 → 34
P: 17, 9, 1 → 27
Q: 22, 7, 2 → 31

more votes

Level:
Complete (7)

5. This question refers to pieces *N*, *P*, and *Q*.

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

	Class 1	Class *2*	Class 3
Shape *N*	9	14	11
Shape *P*	1	9	17
Shape *Q*	22	*7*	2

Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select: Shape Q

Explain:

more students voted forit

Level:
Incorrect (3)

Student Sample Responses

7. This question refers to pieces *N, P,* and *Q*

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

	Class 1	Class 2	Class 3
Shape *N*	9	14	11
Shape *P*	1	9	17
Shape Q	22	7	2

Using the information in the chart, Mr. Bell must select one of the shapes co be the symbol. Which one should he select and why?

The shape Mr. Bell should select: _____

Explain: N: it's the biggest

Level:
Incorrect (2)

5. This question refers to pieces *N*, *P*, and *Q*.

In Mr. Bell's classes, the students voted for their favorite shape for a symbol. Here are the results.

	Class 1	Class *2*	Class 3
Shape *N*	9	14	11
Shape *P*	1	9	17
Shape *Q*	22	7	2

Using the information in the chart, Mr. Bell must select one of the shapes to be the symbol. Which one should he select and why?

The shape Mr. Bell should select: Shape P

Explain: Because Shape N, 8 are both lower # than Shape P

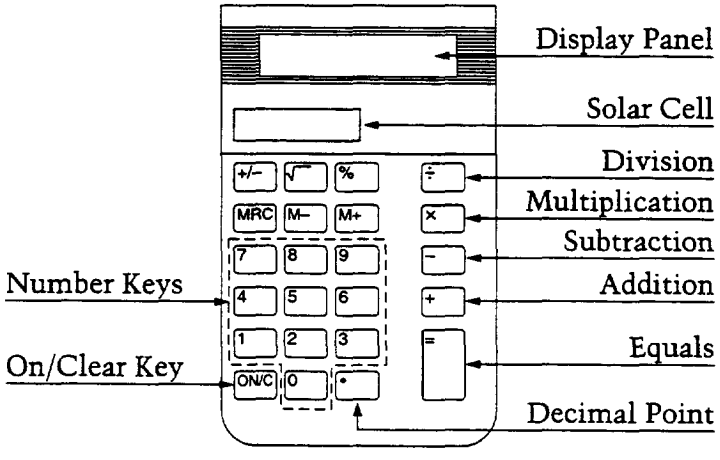
Level:
Incorrect (1)

SECTION 4

YOU WILL NEED A CALCULATOR FOR THIS SECTION.

REMEMBER: You will have to decide when to use the calculator. For some questions using the calculator is helpful, but for other questions the calculator may not be helpful. After each question you will be asked if you used the calculator.

Here is a picture of the calculator you will use. The keys you will need have been identified below.



HOW TO USE THE CALCULATOR

If you have used a calculator before, you should find this one easy to use. If you have not used a calculator before, the following directions will be helpful.

1. Turn on the calculator by pressing [ON/C] . (Do not cover the solar cell.) You should see [0.] . If you do not, raise your hand.

2. Push [1] , then push [6] . You should see [16.] .

3. Now push [ON/C] twice. You should see [0.] Pushing the [ON/C] button twice "clears" or "erases" the numbers you put in the calculator.

4. To enter one dollar twenty-five cents, push [1] [•] [2] [5] . You should see [1.25] .

5. Push [ON/C] twice to clear. To divide 8 by 4, push [8] [÷] [4] [=] . You should see [2.] .

6. Push [ON/C] twice to clear. To compute 42 minus 12, push [4] [2] [−] [1] [2] [=] . You should see [30.] .

ALWAYS REMEMBER TO PUSH [ON/C] TWICE BEFORE YOU START EACH PROBLEM.

GO ON TO THE NEXT PAGE

This part has 6 questions. Mark your answers in your booklet. You will have to fill in an oval or write your answer as directed. In those questions where you must write an answer, it is important that your answer be clear and complete and that you show all of your work since partial credit may be awarded. Some questions may each require 5 minutes or more to think about and answer. After each question, fill in the oval to indicate whether you used the calculator.

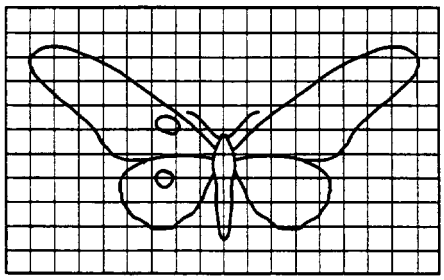
Use the packet you have been given to help **you answer the questions in this section.**

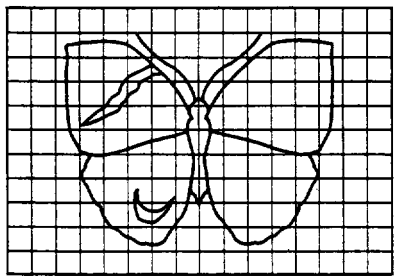
Each class in Oakville School will have a booth at the Science Fair. Your class is planning to have a Butterfly Booth.

Your class has a lot to do to get ready for the Science Fair. You need to make decorations for the booth, plan activities, and order materials.

GO ON TO THE NEXT PAGE

1. The butterfly booth will be decorated with butterfly drawings. Draw only the missing markings on each picture to make each butterfly symmetrical.





Did you use the calculator on this question?

○ Yes ○ No AP002353

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: _____ centimeters

Common Blue Wingspan: _____ centimeters

Did you use the calculator on this question?

○ Yes ○ No AP002350

GO ON TO THE NEXT PAGE

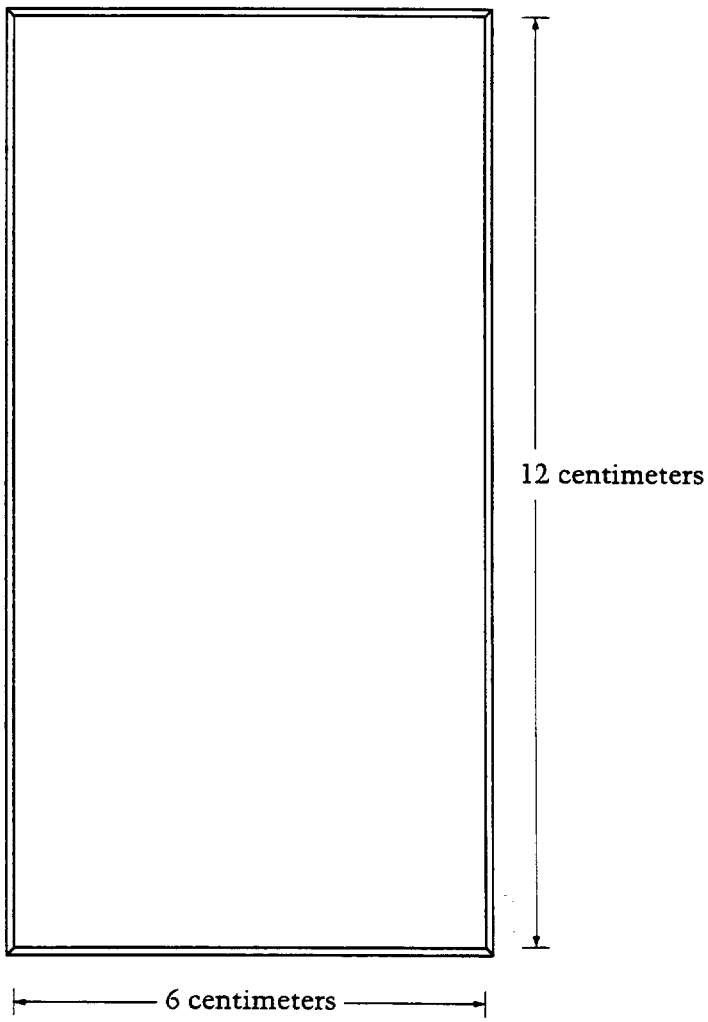
3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butterflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: _____

Show how the butterflies fit in the case.

Storage Case



GO ON TO THE NEXT PAGE

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: _____

Use drawings, words, or numbers to explain how you got your answer.

Did you use the calculator on this question?

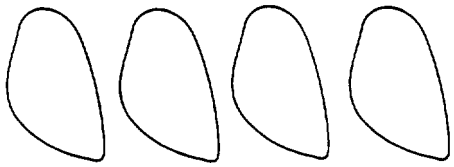
○ Yes ○ No

AP002351

GO ON TO THE NEXT PAGE

4. The children who visit your booth are going to build models of butterflies. For each model, they will need the following:

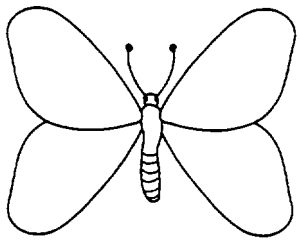
4 wing pieces



1 body

2 antennae

When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made?

Answer: _____

Use drawings, words, or numbers to explain how you got your answer.

Did you use the calculator on this question?

○ Yes ○ No

AP002354

GO ON TO THE NEXT PAGE

5. A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would they need each day for 12 caterpillars?

Answer: _____

Use drawings, words, or numbers to show how you got your answer.

Did you use the calculator on this question?

○ Yes ○ No

AP002359

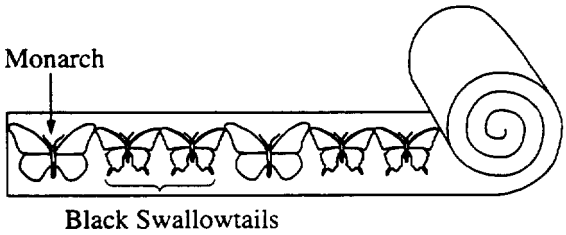
GO ON TO THE NEXT PAGE

6. Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. This banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies, as shown here.

This part keeps repeating across the banner.

"The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

Monarch _____

Black Swallowtail _____

Show how you got your answers.

GO ON TO THE NEXT PAGE

If you need more room for your work, use the space below.

Did you use the calculator on this question?

○ Yes ○ No

AP002352

NAEP MATHEMATICS CLASSIFICATION CODES

Following this description of the Classification Codes, there is a single sheet with NAEP ID numbers, short descriptions of the items, item keys (1-5 if the item is multiple-choice; blank if the item is open-ended), as well as the p-values for the items in the released block.

After the single sheet with NAEP IDs, there follows a 4-line listing of information about each of the items in the released blocks. If the item is open ended, the Key is given as either “NONE" or “See scoring guide.” There are seven fields under the line “Classification Codes” in the listing of items. The fields areas follows:

Field 1: **AGE/GRADE CLASSIFICATION**

01 Grade 4
02 Grade 8
03 Grade 12

Field 2: **CONTENT AREA A, B, C, D, E**

A Number Sense, Properties, and Operations
B Measurement
C Geometry
D Data Analysis, Statistics, and Probability
E Algebra and Functions

Field 3: **SUB-CONTENT AREA**

This category varies depending on the value in field 2. . Possible choices are given below.

*If field 2 is **A:*** Number Sense, Properties, and Operations

1. Relate counting, grouping, and place value
2. Represent numbers and operations in a variety of equivalent forms using models, diagrams, and symbols.
3. Compute with numbers (i.e., add, subtract, multiply, divide)
4. Use computation and estimation in applications
5. Apply ratios and proportional thinking in a variety of situations
6. Use elementary number theory

*If field 2 is **B:*** Measurement

1. Estimate the size of an object or compare objects with respect to a given attribute (e.g., length, area, capacity, volume. and weight/mass)
2. Select and use appropriate measurement instruments (e.g., manipulative such as ruler, meter stick, protractor, thermometer, scales for weight or mass, and gauges)
3. Select and use appropriate units of measurement, according to two criteria (type of unit; size of unit)

4. Estimate, calculate (using basic principles or formulas), or compare perimeter, area, volume, and surface area in meaningful contexts to solve mathematical and real-world problems
5. Apply given measurement formulas for perimeter, area, column, and surface area in problem settings
6. Convert from one measurement to another within the same system (customary or metric)
7. Determine precision, accuracy, and error
8. Make and read scale drawings
9. Select appropriate methods of measurement (e.g. director indirect)
10. Apply the concept of rate to measurement situations

*If field 2 is **C:** Geometry*

1. Describe, visualize, draw, and construct geometric figures
2. Investigate and predict results of combining, subdividing, and changing shapes (e.g., paper folding, dissecting, tiling, and rearranging pieces of solids)
3. Identify the relationship (congruence, similarity) between a figure and its image under a transformation
4. Describe the intersection of two or more geometric figures
5. Classify figures in terms of congruence and similarity, and informally apply these relationships using proportional reasoning where appropriate
6. Apply geometric properties and relationships in solving problems
7. Establish and explain relationships involving geometric concepts
8. Represent problem situations with geometric models and apply properties of figures in meaningful contexts to solve mathematical and real-world problems
9. Represent geometric figures and properties algebraically using coordinates and vectors

*If field 2 is **D:** Data Analysis, Statistics, and Probability*

1. Read, interpret and make predictions using tables and graphs
2. Organize and display data and make inferences
3. Understand and apply sampling, randomness, and bias in data collection
4. Describe measures of central tendency and dispersion in real-world situations
5. Use measures of central tendency, correlation, dispersion, and shapes of distributions to describe statistical relationships
6. Understand and reason about the use and misuse of statistics in our society
7. Fit a line or curve to a set of data and use this line or curve to make predictions about the data, using frequency distributions where appropriate
8. Design a statistical experiment to study a problem and communicate the outcomes
9. Use basic concepts, trees, and formulas for combinations, permutations, and other counting techniques to determine the number of ways an event can occur
10. Determine the probability of a simple event
11. Apply the basic concept of probability to real-world situations

If field 2 is ***E:*** *Algebra and Functions*

1. Describe, extend, interpolate, transform, and create a wide variety of patterns and functional relationships
2. Use multiple representations for situations to translate among diagrams, models, and symbolic expressions
3. Use number lines and rectangular coordinate systems as representational tools
4. Represent and describe solutions to linear equations and inequalities to solve mathematical and real-world problems
5. Interpret contextual situations and perform algebraic operations on real numbers and algebraic expressions to solve mathematical and real-world problems
6. Solve systems of equations and inequalities using appropriate methods
7. Use mathematical reasoning
8. Represent problem situations with discrete structures
9. Solve polynomial equations with real and complex roots using a variety of algebraic and graphical methods and using appropriate tools
10. Approximate solutions of equations (bisection, sign changes, and successive approximations)
11. Use appropriate notation and terminology to describe functions and their properties (including domain, range, function composition, and inverses)
12. Compare and apply the numerical, symbolic, and graphical properties of a variety of functions and families of functions, examining general parameters and their effect on curve shape
13. Apply function concepts to model and deal with real-world situations
14. Use trigonometry

Field 4: **SUBTOPIC:** a lower case letter further describing the topic
For specifics, see the National Assessment Governing Board's *Mathematics Framework for the 1996 National Assessment of Educational Progress,* pp. 21-36.

Field 5: **MATHEMATICAL ABILITY/PROCESS:**
CU Conceptual Understanding
PK Procedural Knowledge
PS Problem Solving
EO Problem Solving with extended open-ended questions

Field 6: **MATHEMATICAL THEME:**
RE Reasoning
CM Communication
CN Connections

Field 7: **CALCULATOR ACTIVITY**

01 **inactive -** questions whose solution neither requires nor suggests the use of a calculator in fact, a calculator would be virtually useless as an aid to solving a problem.

02 **neutral -** questions in which the solution to the question does not require the use of a calculator. Given the option, some students might choose to use it for numerical computations.

03 **active -** questions that, by their nature, require calculator use; a student might find it impossible to solve the question without the aid of a calculator.

In any field: NA = Not Applicable, or Not Available

AS AN EXAMPLE, the classification below

02 E l b CU RE 02

would be interpreted as follows:

Grade 8; Algebra and Functions; 1. Describe, extend, interpolate (etc.); b. Extend; Conceptual Understanding; Reasoning; Calculator neutral

1996 Mathematics Items

GRADE: 04 BLOCK: 27M22

ITEM	NAEP ID	SHORT DESCRIPTION	KEY	CONTENT	PROCESS	P-VALUE	RELEASE STATUS
1A	M084901	DRAW SYMMETRIC FIGURE		3	3	0.439	P
2A	M084902	MEASURE LENGTHS USING RULER		2	2	0.559	P
3A	M084903	SOLVE PACKING PROBLEM		2	3	0.307	P
4A	M084904	DETERMINE NUMBER OF MODELS		1	3	0.183	P
5A	M084905	DETERMINE NUMBER OF LEAVES		1	3	0.091	P
6A	M084906	INTERPRET PATTERN OF FIGURES		5	3	0.049	P

Content:
1 = Numbers & operations
2 = Measurement
3 = Geometry
4 = Data analysis, statistics & probability
5 = Algebra & functions

Process:
1 = Conceptual understanding
2 = Procedural knowledge
3 = Problem solving

Mathematics 1996 Grade 4 Block 27M22 A

04/05/97

Item Number: 1 **Accession Number:** AP002353
Key: See scoring guide
Classification Codes:
01 C 3 a PS RE 01

Item Number: 2 **Accession Number:** AP002350
Key: See scoring guide
Classification Codes:
01 B 2 NA PK NA 01

Item Number: 3 **Accession Number:** AP002351
Key: See scoring guide
Classification Codes:
01 B 4 a EO RECM 02

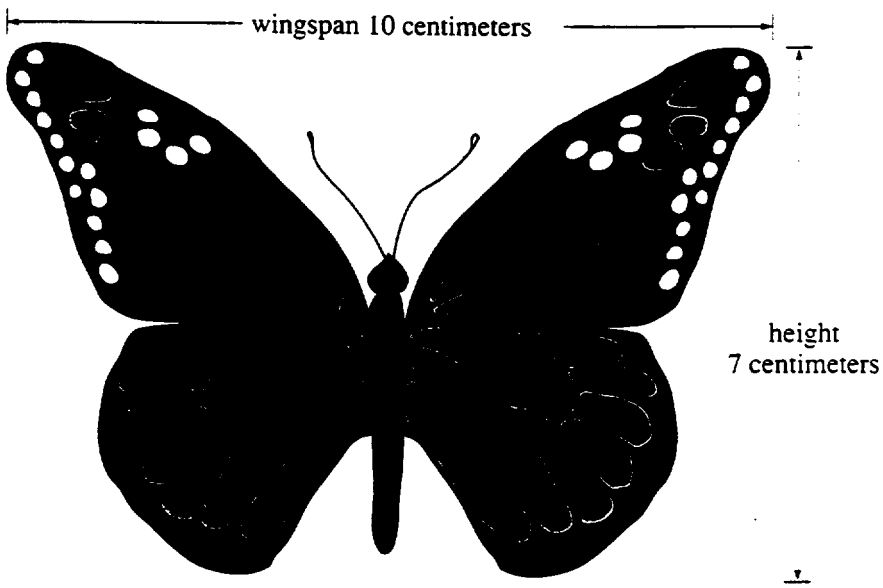
Item Number: 4 **Accession Number:** AP002354
Key: See scoring guide
Classification Codes:
01 A 4 d EO RECM 02

Item Number: 5 **Accession Number:** AP002539
Key: NONE
Classification Codes:
01 A 2 d PS RECM 02

Item Number: 6 **Accession Number:** AP002352
Key: See scoring guide
Classification Codes:
01 E 1 b EO RECMCN 02

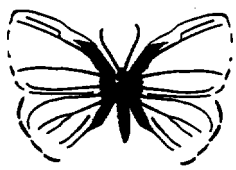
Grade 4- Block 22

BUTTERFLY INFORMATION SHEET



Monarch Butterfly

Black Swallowtail Butterfly



Common Blue Butterfly

Print File: S1M22 Work Sheet: S1M22 5/22/1997 03:53 PM

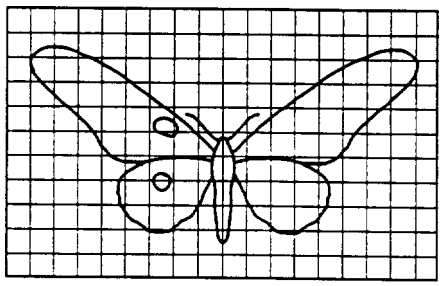
Item Number: 1 Accession Number: AP002353

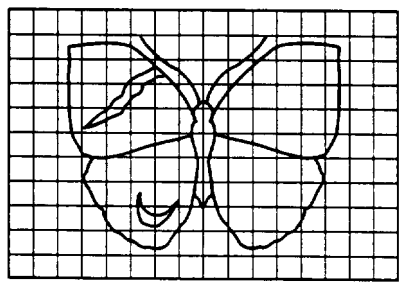
Key: See scoring guide

Classification Codes:
*N25M4 1 C 03 a PS RE 01

Open Codes: P NA NA 4

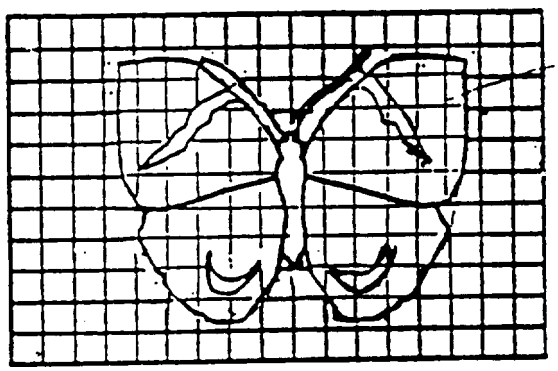
The butterfly booth will be decorated with butterfly drawings. Draw only the missing markings on each picture to make each butterfly symmetrical.





Rationale Text:
Solution:

The following template shows where the students' marks should be located.



There are four parts for the student to complete. Each mark must be at least half inside the area indicated on the template.

The mark for the upper wing of the right hand butterfly must be slanted toward the right in order to be considered correct.

Scoring Guide:

1 Incorrect response

2 One or two correct parts; remaining parts either omitted or incorrect.

3 Three correct parts; remaining part either omitted or incorrect.

4 All four parts correct

[Note to scorer: For template, at least half the circle must be inside the box.]

Item Number: 2 Accession Number: AP002350

Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: _____ centimeters
Common Blue Wingspan: _____ centimeters

Rationale Text:

Solution:

The wingspans are:

Black Swallowtail 7 centimeters
Common Blue 3 centimeters

Scoring Guide:

1 Incorrect response

2 **Incorrect response** -- student measured in inches
(2½ - 3 inches and 1 - l½ inches)
[Must have both for score 2]

3 **Incorrect response** -- student measured height
(5 - 5½ cm and 2 - 2½ cm)
[Must have both for score 3]

4 One measurement correct or measurements correct, but reversed
OR
numbers that would round to 7 and 3 (6.5 - 7.5) and (2.5 - 3.5)
1 only - reversed/rounding
7cm/3cm

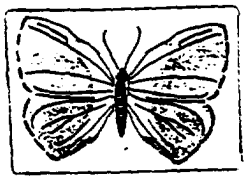
5 Both measurements correct

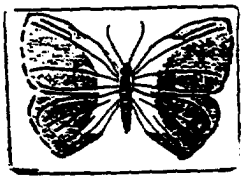
Example of correct process - score 3

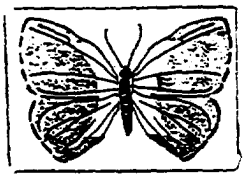
60
70

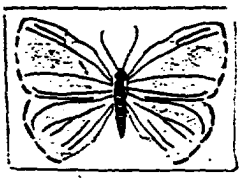
Work: 60
+70
130

Grade 4- Block 22
Cut Outs for Item #3









Item Number: 3 Accession Number: AP002351

Key: See scoring guide

Classification Codes:
N25M4 1 B 04 a EO RECM 02

Open Codes: A NA NA 5

Rationale Text:

Solution:

1) 12 Common Blues fit
(Student= can use the cut out mode to solve this.)

2) $\frac{28}{12}$ =2 R4 Therefore, 3 cases would be needed Also $2\frac{1}{3}$ cases is acceptable.

Note 1: Work shown on second page can count as the work for part 1.
Note 2: If student answers 10 in part 1, and if it is clear that student traced carefully and could only fit in 10, then score part 1 as if student answered 12 with work.

Scoring Guide:

1 No correct response includes totally wrong answer in part 1, i. e., anything other than 10, 11, 12

2 Answers 10 or 11 in part 1, with or without work; part 2 incorrect.
OR
Answers 10 or 11 to part 1, without work; part 2 answer is consistent, but explanation inadequate (or missing).
OR
Answers 12 in part 1, with or without work; part 2 incorrect.

3 Answers 10 or 11 in part 1, with or without work; part 2 has correct process but incorrect answer.
OR
Answers 10 or 11 in part 1, without work; part 2 answer is consistent, explanation acceptable.
OR
Answers 10 or 11 in part 1, with work; part 2 answer is consistent, but explanation inadequate (or missing).
OR
Answers 12 in part 1, without work; process in part 2 is correct but answer incorrect.
OR
Answers 12 in part 1, without work; answer to part 2 is 3 (or $2\frac{1}{3}$; but explanation inadequate (or missing).

4. Answers 12 in part 1, with work; process in part 2 is correct but answer

incorrect. (lacks answer in part 2)
OR
Answers 12 in part 1, with work; answer to part 2 is 3 (or $2\frac{1}{3}$) but explanation inadequate (or missing) [lacks explanation in part 2]
OR
Answers 12 in part 1, without work; correct answer and explanation in part 2. [lacks explanation in part 1]
OR
Answers 10 or 11 in part 1, with work; correct answer and explanation in part 2. [all right except 10 or 11 (vs 12) in part 1]

5. Answers 12 in part 1, with work; correct answer and explanation in part 2.

SUMMARY OF SCORING GUIDE (Block 22, Question 3)

PART 1		PART 2		
Answer	Work	Answer	Explanation	Score
10 or 11	no	incorrect	no	2
10 or 11	✓	incorrect	no	2
10 or 11	no	consistent	no	2
12	no	incorrect	no	2
12	✓	incorrect	no	2
10 or 11	✓ or no	incorrect	✓ (process)	3
10 or 11	no	consisent	✓	3
10 or 11	✓	consisent	no	3
12	no	incorrect	✓ (process)	3
12	no	correct	no	3
12	no	correct	✓ (process)	4
12	✓	incorrect	✓ (process)	4
12	✓	correct	no/inadequate	4
10 or 11	✓	consisent	✓	4
12	✓	3	✓	5
10 (when traced)	✓	3	✓	5

wrong remainder (other than 4) is inadequate process

Item Number: 4 Accession Number: AP002354

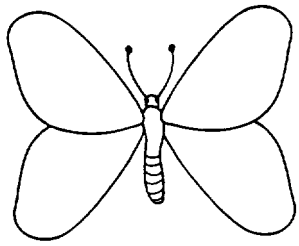
Key: See scoring guide

Classification Codes:
*N25M4 1 A 04 d EO RECM 02

Open Codes: P NA NA 4

The children who visit your booth are going to build models of butterflies. For each model, they will need the following:

When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made?

Answer: _____

Use drawings, words, or numbers to explain how you got your answer.

Rationale Text:

Solution:

29 wings pieces (need 4 for each)

$4\overline{)\,29}$ $7\ r = 1$ can supply wings for 7

8 bodies (need 1 for each) can supply bodies for 8

13 antenna (need 2 for each)

$2\overline{)13}$ $6\ r = 1$ can supply antennae for 6

Since you can't turn the extra bodies into antennae, you can make only 6 models,

Scoring Guide:

1 Incorrect response add 29 + 8 + 13 = 50 $7\overline{)50}$ $7\ r = 1$ "not enough parts"

2 Some evidence that numbers of parts influences number of models
E.g., 8 bodies, therefore, 8 models - 8 with drawing of 8 butterflies

3 Correct answer, 6, but explanation incomplete/error
OR
Correct explanation and work, but rounds $6\frac{1}{2}$ to 7 and answers 7
(small error leads to incorrect answer)

4 Correct explanation, work and answer

5 extra wings
1 extra antennae
2 extra bodies

Item Number: 5 Accession Number: AP002359

Key: See scoring guide

Classification Codes:
*N25M4 1 A 05 a PS RECM 02

Open Codes: P NA NA 3

A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would they need each day for 12 caterpillars?

Answer: _____

Use drawings, words, or numbers to show how you got your answer.

Rationale Text:
Solution:

Answer: 30

12 caterpillars is 6 pairs; 5 leaves for each pair

$5 \times 6 = 30$

OR

$\frac{2}{5} = \frac{12}{30}$

$$\begin{array}{r} 12 \\ \times\ 5 \\ \hline 60 \end{array} \qquad 2\overline{)60}\ 30$$

Pictorial responses are also possible.

Scoring Guide:

1 Incorrect response, including 60 (with or without work) - if work → ***60***

2 Correct answer with no work shown (including incorrect work)
OR
Correct method with computational error (including correct method with answer 60)

3 Correct answer with work correct and complete method or process shown.

Item Number: 6 Accession Number: AP002352

Key: See scoring guide

Classification Codes:
*N25M4 1 E 01 b E0 RECMCN 02

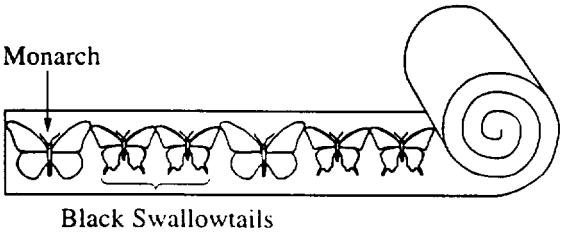
Open Codes: A NA NA 4

Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. The banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies as shown here.

This part keeps on repeating across the banner.

The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

Monarch _____

Black Swallowtail _____

Show how you got your answers.

Rationale Text:

Solution:

Monarch	Black Swallowtail	Black Swallowtail
10	7	7

10 + 7 + 7 = 24

$$24\overline{)130}\quad 5,\ -120,\ 10$$

10 enough for 1 more Monarch

5 sets + 1 Monarch

Therefore, need 6 Monarchs, 10 Black Swallowtails

Note: This item needs to be scored based on students answers to number 2.

Scoring Guide:

1 Incorrect response

2 Gives any of the responses 4 and 8, 5 and 8, 5 and 10, 6 and 12, 7 and 12, with no explanation/or inadequate explanation
Just working with the pattern is not enough, since we tell (and show) the pattern.

3 Answers 6 and 10 with no explanation or an incomplete explanation
OR
has correct process (numerical) with the wrong numbers (requires pattern correct)

4 Answers 6 Monarchs, 10 Black Swallowtails with adequate explanation

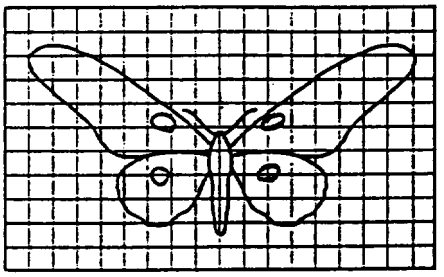
Example of correct process or adequate explanation

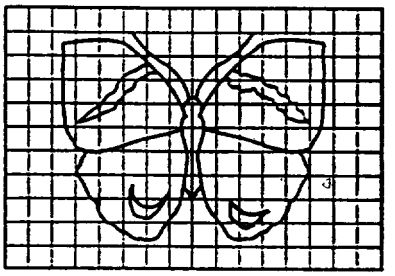
$$\underline{60} \qquad \underline{70} \qquad \begin{array}{r} 60 \\ \underline{+70} \\ 130 \end{array}$$

But score 1: $130 \div 10 = 13$
$130 \div 7 =$

Student Sample Responses

1. The butterfly booth will be decorated with butterfly drawings. Draw only the missing markings on each picture to make each butterfly symmetrical.



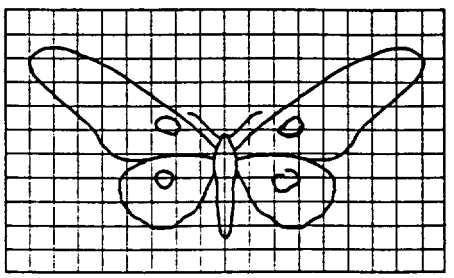


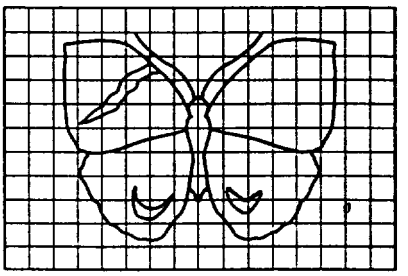
Did you use the calculator on this question?

○ Yes ● No

Level:
Satisfactory (4)

1. The butterfly booth will be decorated with butterfly drawings. Draw only the missing markings on each picture to make each butterfly symmetrical.





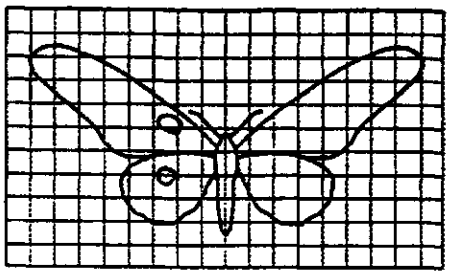
Did You use the calculator on this question?

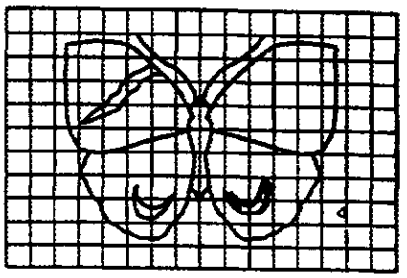
○ Yes ○ No

Level:
Partial (3)

Student Sample Responses

1. The butterfly booth will be decorated with butterfly drawings. Draw only the missing markings on each picture to make each butterfly symmetrical.



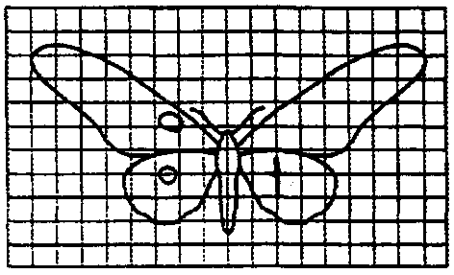


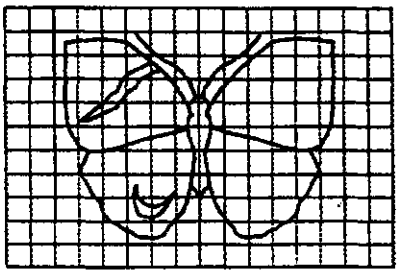
Did you use the calculator on this question?

O Yes O N O

Level:
Minimal (2)

1. The butteffly booth will be decorated with butteffly drawings. Draw only the missing markings on each picture to make each butteffly symmetrical.





Did you use the calculator on this question?

O Yes O N O

Level:
Incorrect (1)

Student Sample Responses

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: 7 centimeters

Common Blue Wingspan: 3 centimeters

Did you use the calculator on this question?

○ Yes ● No

Level:
Extended (5)

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: 7 centimeters

Common Blue Wingspan: 2 centimeters

Did you use the calculator on this question?

○ Yes ● No

Level:
Satisfactory (4)

Student Sample Responses

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: 5 centimeters

Common Blue Wingspan: 2 centimeters

Did you use the calculator on this question?

○ Yes ○ No

Level:
Partial (3)

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: 3 centimeters

Common Blue Wingspan: 1 centimeters

Did you use the calculator on this question?

○ Yes ○ No

Level:
Minimal (2)

Student Sample Responses

2. Take the Butterfly Information Sheet from your packet.

On the Butterfly Information Sheet the wingspan of the Monarch butterfly is shown.

Use your ruler to measure the wingspans of the other two butterflies on the sheet, the Black Swallowtail butterfly and the Common Blue butterfly, to the nearest centimeter

Black Swallowtail Wingspan: 8 centimeters

Common Blue Wingspan: _____ centimeters

Did you use the calculator on this question?

○ Yes ○ No

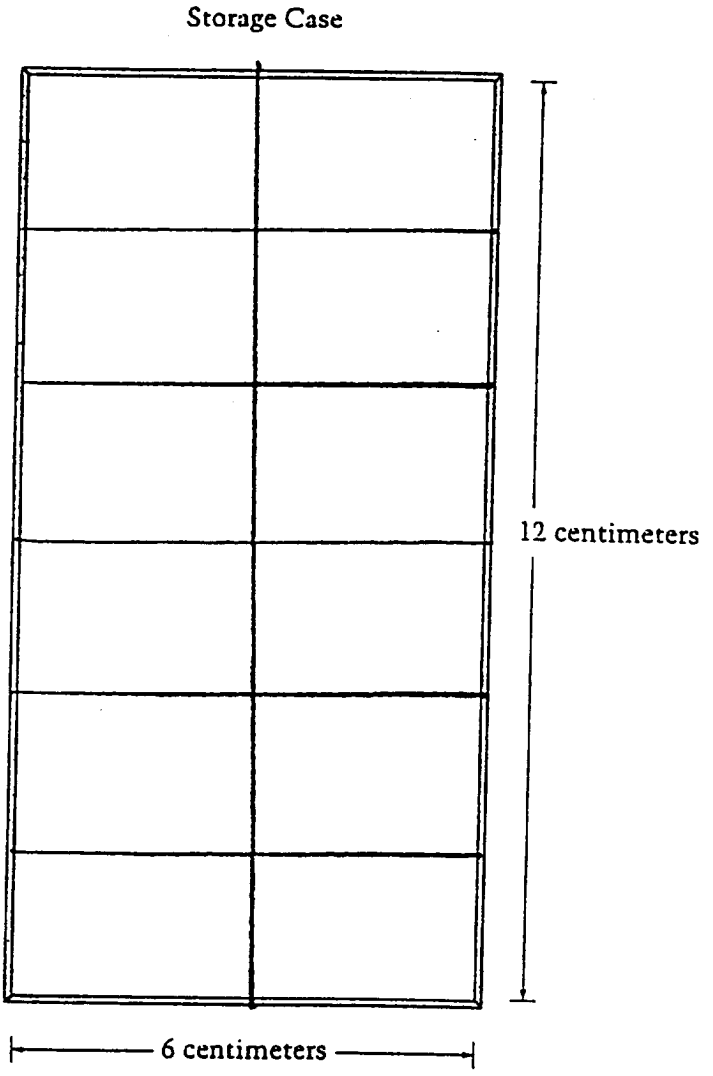
Level:
Incorrect (1)

3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butterflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: 12 butterflies

Show how the butterflies fit in the case.



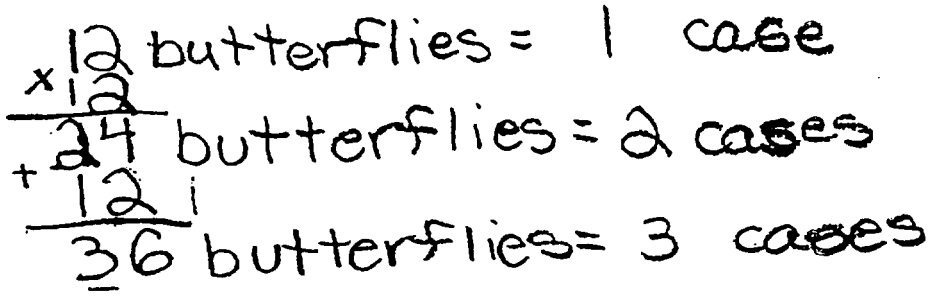
Level:
Extended (5)

Student Sample Responses

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: 3

Use drawings, words, or numbers to explain how you got your answer.



Did you use the calculator on this question?

○ Yes ● No

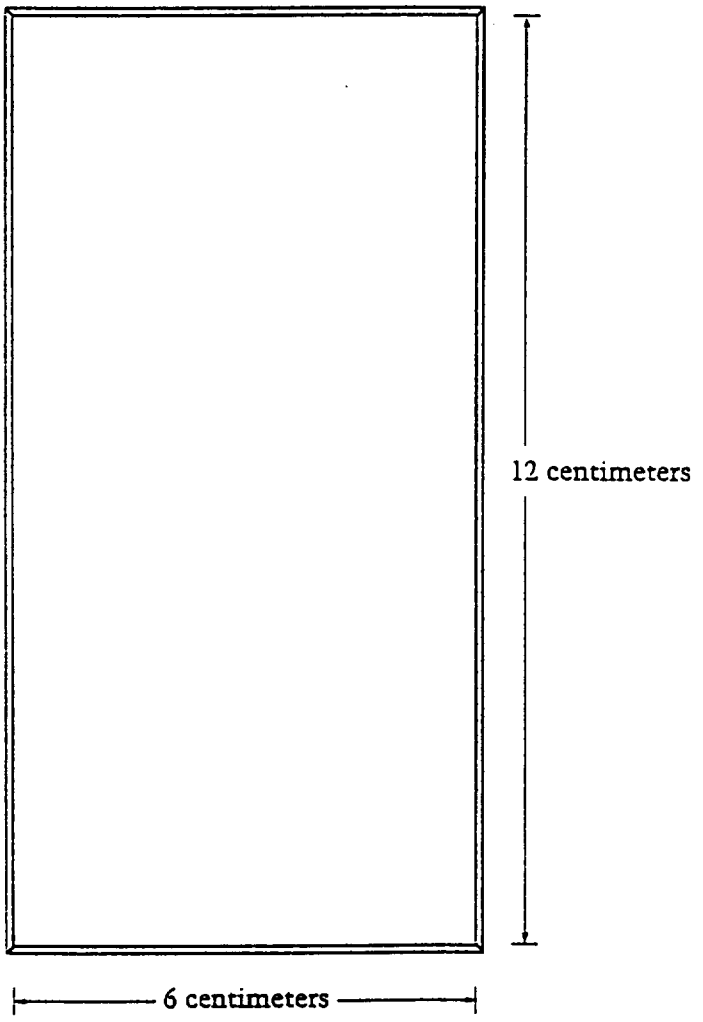
3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butterflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: 12 butterflies

Show how the butterflies fit in the case.

Storage Case



Level:
Satisfactory (4)

Student Sample Responses

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: 3

Use drawings, words, or numbers to explain how you got your answer.

I new 12 could fit in a case. Then I multiplied 12 times and got 24. Then I new I would have to get another case because I couldnt any more in that case

Did you use the calculator on this question?

○ Yes ● No

Student Sample Responses

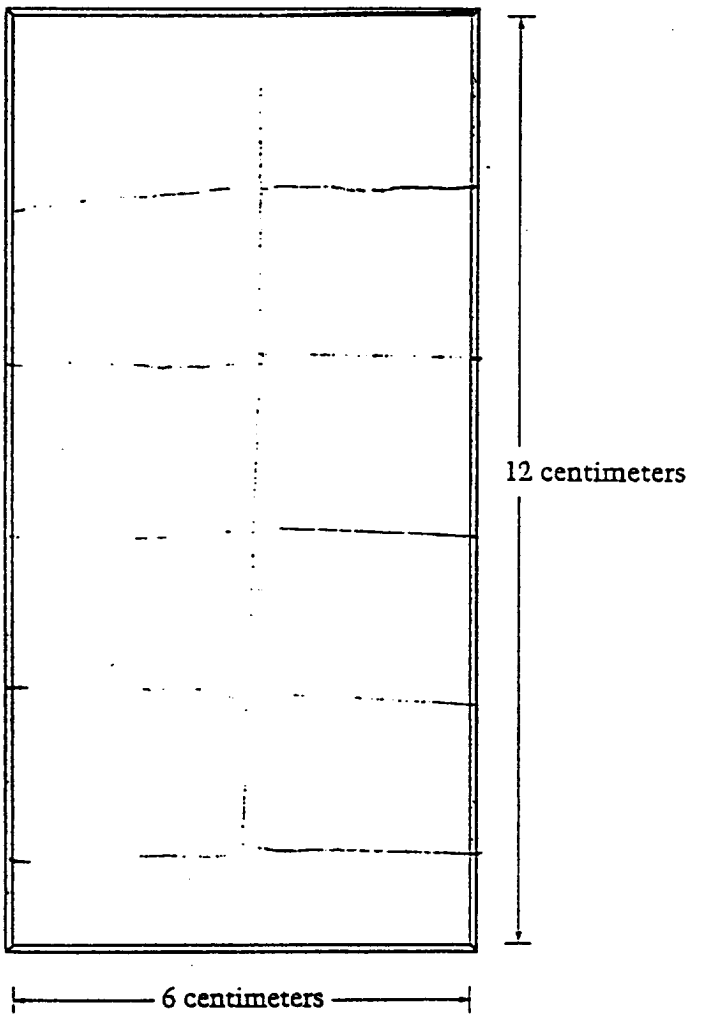
3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butterflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: 10

Show how the butterflies fit in the case.

Storage Case



Level:
Partial (3)

Student Sample Responses

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: 3

Use drawings, words, or numbers to explain how you got your answer.

I mesured the Blue Butterfly's wing span and hight then I took my ruler Put it on the box and mesured 5 dow and 2 cueross and I multiplied and got the answer 10

Did you use the calculator on this question?

○ Yes ● No

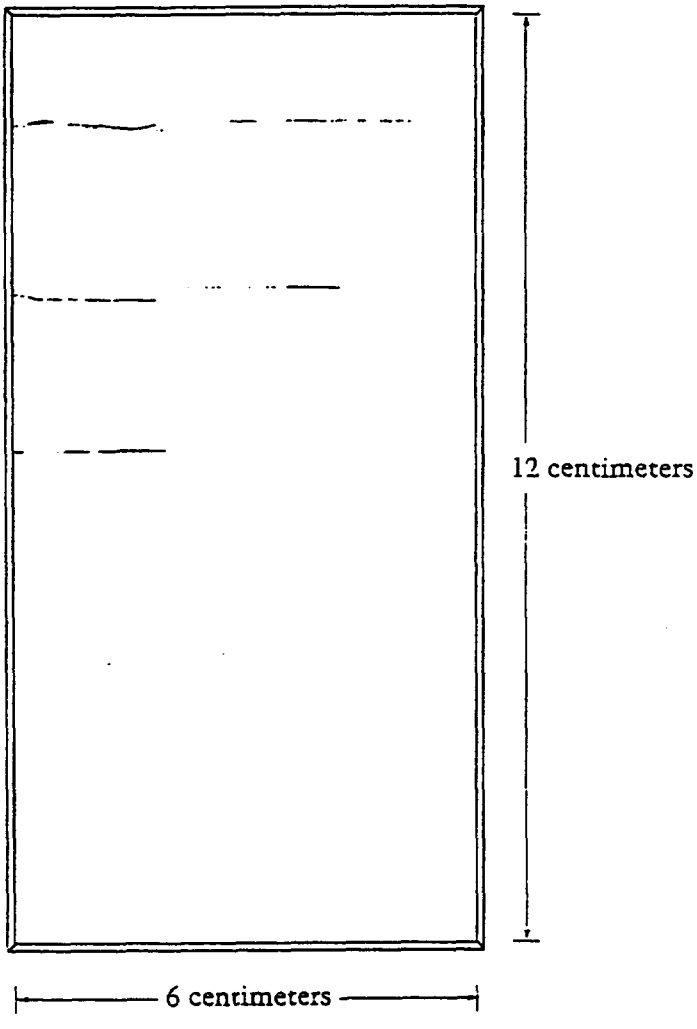
3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butterflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: 10

Show how the butterflies fit in the case.

Storage Case



Level:
Minimal (2)

Student Sample Responses

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: 3

Use drawings, words, or numbers to explain how you got your answer.

I put the Butterflys in the storage case.

Did you use the calculator on this question?

○ Yes ● No

Student Sample Responses

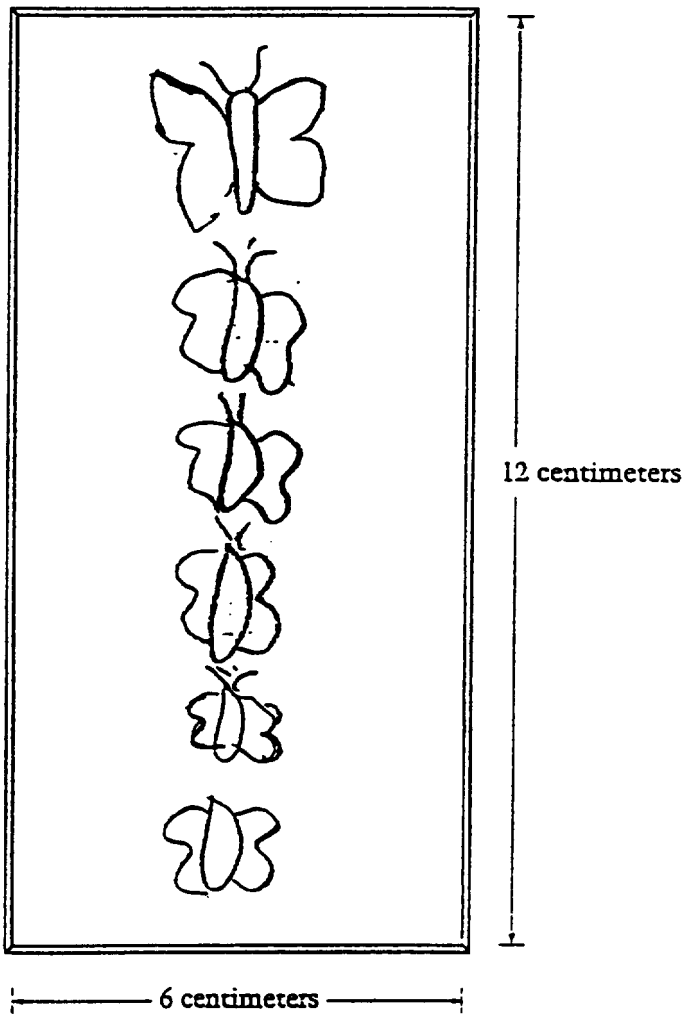
3. Take the butterfly cutouts from your packet.

What is the greatest number of Common Blue butteflies that can be stored in the case below? (When you put butterflies in the case, you can't stack them. The butterflies can touch, but they can't overlap at all.)

Answer: 6

Show how the butterflies fit in the case.

Storage Case



Level:
Incorrect (1)

Student Sample Responses

How many storage cases would you need to store 28 Common Blue butterflies?

Answer: 34

Use drawings, words, or numbers to explain how you got your answer.

IF There are 6 butterflies in one storage case add 6 and 28 to get 34

Did you use the calculator on this question?

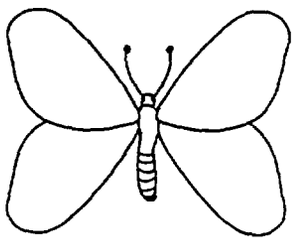
● Yes ○ No

Student Sample Responses

4. The children who visit your booth are going to build models of butterflies. For each model, they will need the following

4 wing pieces 1 body 2 antennae

When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made?

Answer: 6

Use drawings, words, or numbers to explain how you got your answer.

4 wings for each model.
4)29 with one leftover. There is eight bodies so you'll have 1 left over but there is only 13 antennae, so you can only make 6

Did you use the calculator on this question?

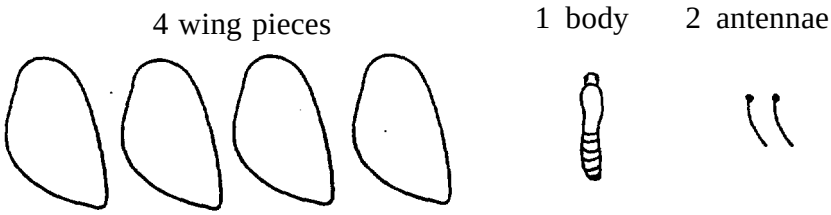
Level:
Satisfactory (4)

● Yes ○ No

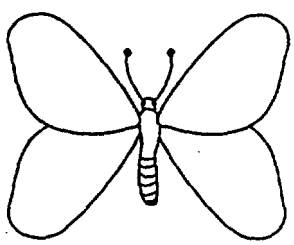
Student Sample Responses

Block : S1M22

4. The children who visit your booth are going to build models of butterflies. For each model, they will need the following



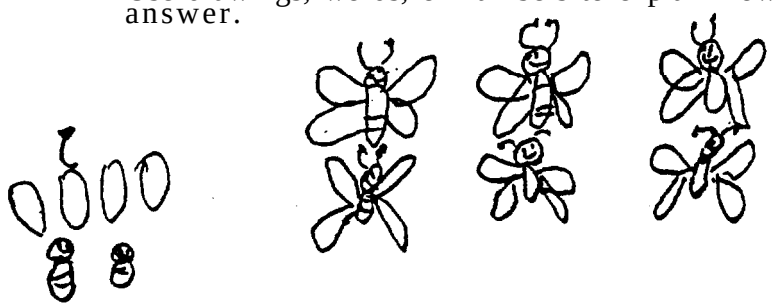
When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made?

Answer: 6 models

Use drawings, words, or numbers to explain how you got your answer.



Did you use the calculator on this question?

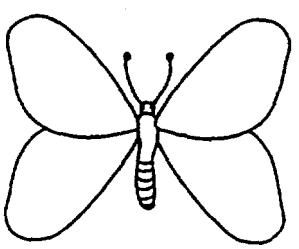
Level:
Partial (3)

● Yes ○ No

Student Sample Responses

4. The children who visit your booth are going to build models of butterflies. For each model, they will need the following

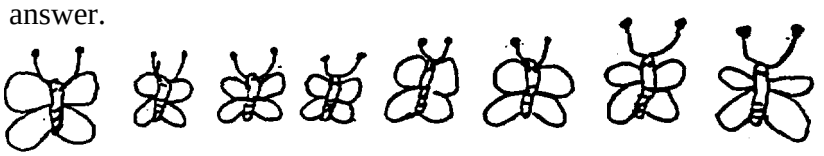
When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made?

Answer: 8

Use drawings, words, or numbers to explain how you got your answer.



Did you use the calculator on this question?

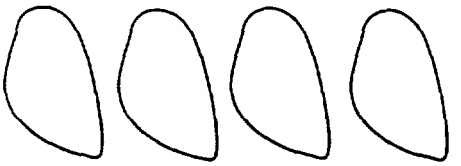
○ Yes ○ No

Level:
Minimal (2)

Student Sample Responses

4. The children who visit your booth are going to build models of butterflies. For each model, they will need the following

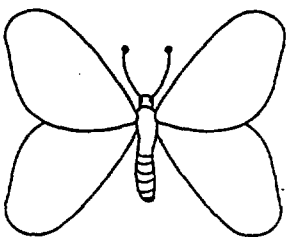
4 wing pieces



1 body

2 antennae

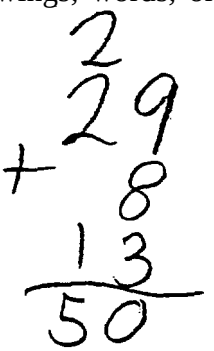
When the model is put together it looks like this:



If the class has a supply of 29 wings, 8 bodies, and 13 antennae, how many complete butterfly models can be made ?

Answer: 50

Use drawings, words, or numbers to explain how you got your answer.



Did you use the calculator on this question?

○ Yes ● No

Level:
Incorrect (1)

Student Sample Responses

5. A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would they need each day for 12 caterpillars?

Answer: 30 leaves

Use drawings, words, or numbers to show how you got your answer.

$\begin{array}{r} 2 \\ \times 6 \\ \hline 12 \end{array}$ $\begin{array}{r} 6 \\ \times 5 \\ \hline 30 \end{array}$

Did you use the calculator on this question?

Level:
Complete (3)

○ Yes ● No

5. A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would they need each day for 12 caterpillars?

Answer: 30

Use drawings, words, or numbers to show how you got your answer.

If each caterpillar gets 2½ leaves you need 30 leaves

Did you use the calculator on this question?

Level:
Partial (2)

● Yes ○ No

Student Sample Responses

5. A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would they need each day for 12 caterpillars?

Answer: 60

Use drawings, words, or numbers to show how you got your answer.

I counted by fives up to 12 and I got 60.

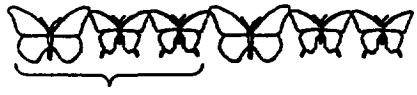
Did you use the calculator on this question?

○ Yes ● No

Level
Incorrect (1)

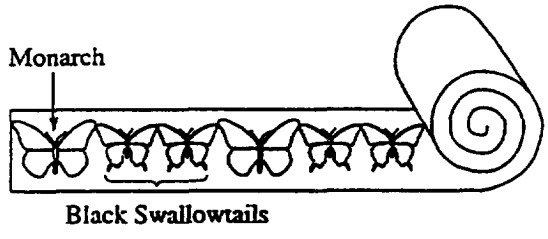
6. Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. This banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies, as shown here.



This part keeps repeating across the banner.

The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

Monarch 16

Black Swallowtail 10

Show how you got your answers.

M WW M WW M WW M WW M WW M
10 14 10 14 10 14 10 14 10 14 1

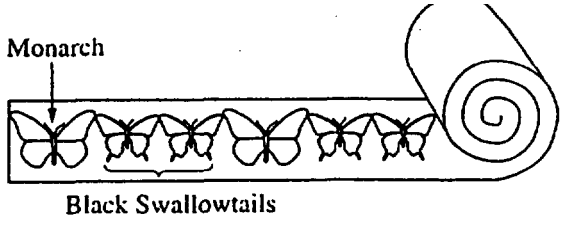
Level:
Satisfactory (4)

6. Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. This banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies, as shown here.

This part keeps repeating across the banner.

The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

Monarch 5

Black Swallowtail 8

Show how you got your answers.

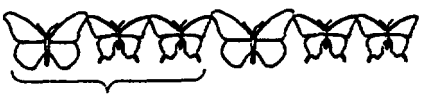
Both of the wingspans on one set was 24 and I just kept adding and adding it together and counting as I go to get the answer of 5 Monarchs and 8 Blackswallowtail.

Level:
Partial (3)

Student Sample Responses

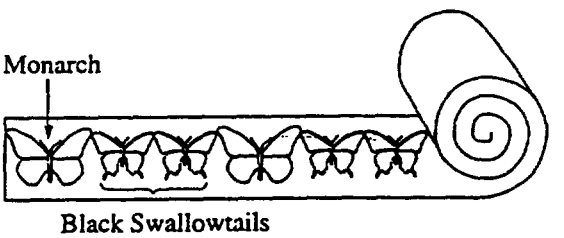
6. Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. This banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies, as shown here.



This part keeps repeating across the banner.

The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

Monarch 4

Black Swallowtail 9

Show how you got your answers.

Level:
Minimal (2)

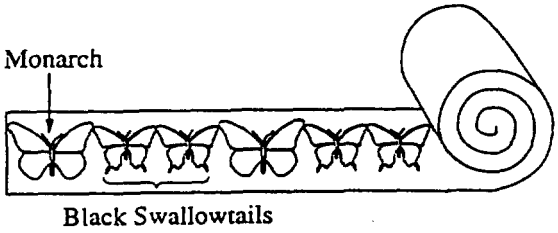
Student Sample Responses

6. Use the Butterfly Information Sheet and your answer from question 2 to solve this question.

Your class has decided to have a banner that will be 130 centimeters long. This banner will have a repeating pattern of one Monarch butterfly followed by two Black Swallowtail butterflies, as shown here.

This part keeps repeating across the banner.

The butterflies will just touch but will not overlap.



How many of each type of butterfly are needed for the banner?

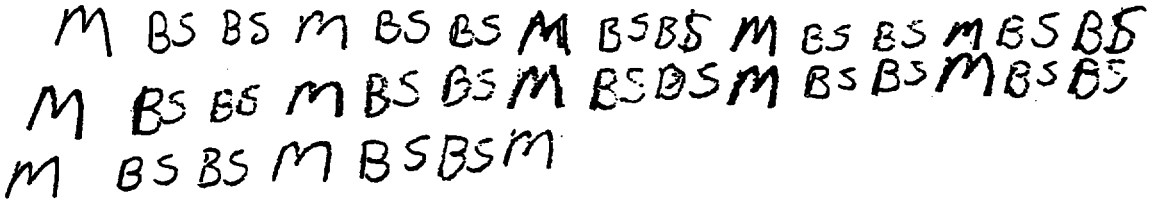
Monarch 13

Black Swallowtail 24

Show how you got your answers.

Level:
Incorrect (1)

If you need more room for your work, use the space below.



Did you use the calculator on this question?

○ Yes ● No